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## EVAPORATION RATES OF CHEMICAL WARFARE AGENTS USING 5-CM WIND TUNNELS I. CASARM SULFUR MUSTARD (HD) FROM GLASS

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#### **PREFACE**

The work described in this report was authorized under Contract No. DAAD13-03-D-0017. The work was started in April 2005 and completed in October 2008.

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### EVAPORATION RATES OF CHEMICAL WARFARE AGENTS USING 5-CM WIND TUNNELS I. CASARM SULFUR MUSTARD (HD) FROM GLASS

#### 1. INTRODUCTION

The evaporation rate of the vesicant chemical warfare (CW) agent sulfur mustard (bis(2-chloroethyl)sulfide, (ClCH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>S, abbreviated H for munitions grade and HD for CASARM grade) from glass was determined as a prelude to measurements from the operationally relevant substrates concrete and sand. The inability to control outdoor temperature and wind speeds, coupled with the requirement for large amounts of agent and personnel, lcd to the need for evaporation experiments in a controlled environment, thus, the wind tunnels were designed. The measurement of 97% pure agent from a non-porous, non-interacting surface allowed for a comparison of the wind tunnels and a test of the agent detection methods used.

In this work, the vapor flux of CASARM grade HD evaporating from glass surfaces was measured as a function of drop size, temperature, and flow rate using four previously-designed laboratory-sized wind tunnels<sup>1</sup> from which the vapors were quantitatively collected using thermal desorption tubes. Reports that document the wind tunnel characteristics and comparisons to other wind tunnels have been published.<sup>2,3</sup> In addition, video cameras were used to show that the loss of HD vapor was coincident with the disappearance of the droplet.<sup>4</sup> This report describes how the data were analyzed and demonstrates the robustness of the set of data that will be passed to the modelers.

#### 2. EXPERIMENTAL PROCEDURES

#### 2.1 Wind Tunnel

The 5-cm wind tunnels used in these experiments have been described previously (Figure 1).<sup>5</sup> To expose the agent to the wind flow, the piston was removed, and the test substrate (a 1.5 in. diameter circle) with the droplet of agent on it was placed on the piston and inserted into the wind tunnel. The humidified, temperature-controlled air from a Miller-Nelson Environmental Control Unit (ECU) (Monterey, CA) (tunnel a) or an Aalborg MFC (Orangeburg, NY) (tunnels c, d, k, l) was then passed over the sample, and the vapors were collected on thermal desorption tubes at the vapor sampling inlet. The amount of agent on each tube was measured based upon a standard in the GC/MS. The sample volume and tunnel airflow rate were known, thus, the agent concentration (mg/m³) and evaporation rate (microgram/minute) could be calculated. The rates were not calculated for the initial 5 min of the experiment, before the instrumentation had reached equilibrium, nor at the end of the experiment, when the concentration of mustard was nearing a plateau. Hence, the middle of the concentration data was used to calculate the evaporation rates.

Airflows were 18-, 181- and 405- standard liters per minute (SLPM), which resulted in measured velocity values at a 1-cm height of 0.22, 1.7 and 3.6 m/s. For additional information on how to scale the 5-cm wind tunnel data to outdoor data see the reports by Weber et al. 1,2,3 The flow volume per thermal desorption tube was typically 2 to 10 L volume, and the

tubes were automatically switched using a proprietary Versatile Tube Sampler. The rate at which the tubes were switched was adjusted based upon the evaporation rate of the agent. The air and substrate temperatures were 15, 35, and 50 °C, and the droplet sizes were 1, 6, and 9  $\mu$ L, corresponding to contamination densities of approximately 1.3, 7, and 11 g/m<sup>2</sup>.

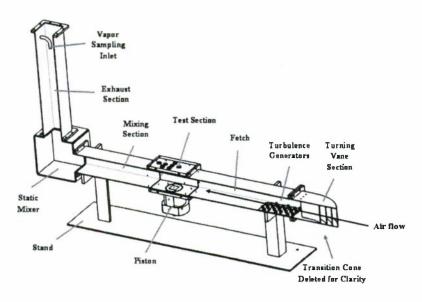


Figure 1. Schematic of the 5-cm Laboratory Wind Tunnel<sup>5</sup>

#### 2.2 Agent

Sulfur mustard, [bis(2-chloroethyl)] sulfide, (ClCH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>S, is commonly abbreviated H for munitions grade and HD for distilled. Distillation removes the impurities that are commonly present in munitions grade mustard: Q (sesquimustard, bis(2-chloroethylthio) ethane, ClCH<sub>2</sub>CH<sub>2</sub>SCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>Cl, 10.1%) the cyclic ether 1,4-dithiane, [S(CH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>S, 3.2%], 1,2-dichloroethane (2.6%) and 4-chlorobutyl 2-chloroethyl sulfide (1.0%) and 16 other analytes (totaling 3.9%). Caution: sulfur mustard is a potent vesicant, and care must be taken to prevent exposure to liquid or vapor. It should only be manipulated by trained personnel employing appropriate engineering controls and personal protective equipment.

#### 2.3 <u>Gas Chromatography/Mass Spectrometry Detection (GC/MSD)</u>

The GC/MSD analysis of the thermal desorption tubes was performed on a Markes UNITY/ULTRA Thermal Desorption system connected to an Agilent Technologies 6890N GC / 5973 MSD equipped with a 30m X 0.25mm HP-5 capillary column (Agilent Technologies, Wilmington, DE). The thermal desorption tubes used were Markes Tenax thermal desorption tubes (Markes International, Llantrisant, UK, Part #C0102S). Each sample was prepurged for 1 min then desorbed for 2.5 min at 250 °C. The transfer line to the GC was heated to 180 °C. The GC oven temperature profile was ramped from 75 °C (2 min), to 110 °C at 20/min, to 290 °C at 80 °C/min. The column flow rate (at 75 °C) was 1.6 mL/min (46 cm/sec) at a constant pressure of 15 psi. The injection temperature was 250 °C; MSD transfer line 180 °C;

MSD quad 150 °C; and MSD source at 230 °C. The sample extracts were analyzed in the electron impact (EI) mode scanning from 30-300 amu, with 2.78 scans/sec. Under these conditions, HD eluted at  $\sim$ 2 min (Figure 2). Sulfur mustard and a breakdown ion were seen in the mass spectrum (Figure 3).

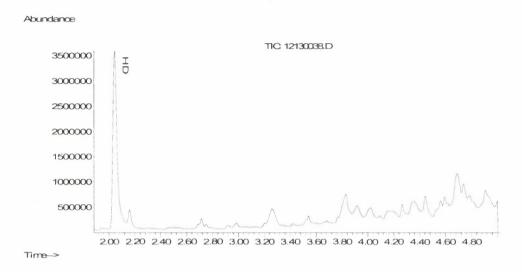


Figure 2. Gas Chromatogram of Sulfur Mustard

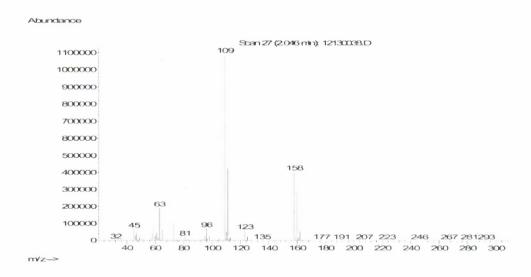


Figure 3. Mass Spectrum of Sulfur Mustard (m/z = 160 and 158) and the First Breakdown Ion (m/z = 111 and 109)

#### 2.4 Substrates

The glass slides used in the wind tunnels were Schott Borofloat glass 1.45"  $\pm\,0.050$  diameter x 0.7 mm thick (Valley Design Corporation, Santa Cruz, CA). The glass slides were washed in laboratory detergent, (Sparkleen Biodegradable Laboratory Detergent

from Fisher), thrice rinsed with deionized water, submerged in nitric acid for 24 hr (EMD), rinsed with deionized water, dried with a paper towel (Kimwipes<sup>®</sup> EXL), rinsed with hexane (EMD OmniSOLV HR-GC Hexanes), and re-dried with a Kimwipe<sup>®</sup>.

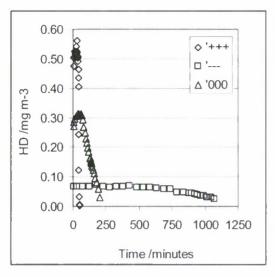
#### 2.5 <u>Experimental Design and Data Analysis</u>

The experimental design was generated, and the data were analyzed using JMP® Statistical Discovery Software (Cary, NC). There were three variables: temperature, drop size, and airflow rate at three levels each. Measuring all combinations of these levels would yield 27 conditions (3 x 3 x 3). The cubic composite design chosen required nine conditions, which can be described as the vertices of a cube and the body mid-point. The data were collected in triplicate as two blocks of four vertices (chosen as the corners of a tetrahedron) and the mid-point. This collection of data would allow for the determination of the major contributing variables and cross-variables. The substrate temperature (°C), droplet mass (mg), airflow (SLPM), total percent HD recovered and tunnel identity (five similar 5-cm tunnels were available) were defined as variables that may affect the raw evaporation rate. Cross factors between droplet mass, airflow and temperature were included.

#### 3. RESULTS

The evaporation profiles for HD on glass varied greatly as a function of drop size, airflow, and temperature (Figure 4). The variables of the samples were coded in terms of (+-0-), where +, 0, - represented the high, middle, and low set points for the variables, and the order was (temperature - drop size - airflow rate - %RH). The evaporation profiles were generated by collecting the HD on the thermal desorption tubes over a period of time (minutes) and dividing the amount of HD collected (milligrams) by the volume of air that had passed through the tube during that period of time (in m³) to give a mustard concentration in the air in milligrams per cubic meter. An additional representation of the data was derived by computing the %HD remaining by subtracting the amount of agent on the thermal desorption tube from the initial droplet mass (which was corrected for the purity of the HD, Figure 5a). This gave a curve of %HD remaining versus time, which could also be converted into a curve of milligrams HD versus time (equivalent to a TGA curve, Figure 5b). The slope for this curve was computed during the linear portion and was used as the evaporation rate (Figure 5b). A summary sheet that includes the tunnel conditions, evaporation profile, %HD remaining, and the raw concentration data was made for each sample (see Appendix I, Table AI-1).

The percentage mustard recovered and the evaporation rates were calculated for each sample. It was observed that the %HD recovered was often not 100%. This was attributed to loss of agent during the first few minutes when the agent was being placed into the wind tunnel, and random variation. Thus, an adjusted evaporation rate was calculated by dividing the raw evaporation rate by the %HD recovered. Whereas the average raw and adjusted evaporation rates were similar, the adjusted evaporation rates generally had a much lower standard deviation than did the raw data (see Appendix I, Table I-1).



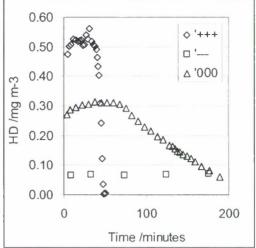
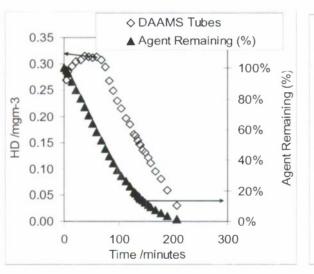


Figure 4. Evaporation Profiles for Sulfur Mustard from Glass at the Highest (+++,  $\diamondsuit$ ), Mid-point (000,  $\triangle$ ) and Lowest (---,  $\square$ ) Wind Tunnel Settings



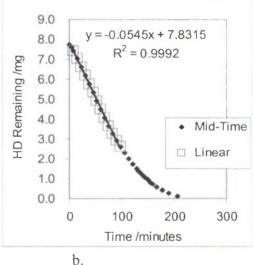


Figure 5. Evaporation Data Expressed in Three Methods: (a) Concentration (⋄mg m<sup>-3</sup>), %HD Remaining (♠) and (b) mg HD Remaining (♠) and the Points used to Calculate the Evaporation Rate (□)

#### 3.1 <u>Effect of Moisture</u>

Prior to comparing all of the data, preliminary tests to measure the effect of relative humidity (RH) and a comparison of all four tunnels (two sub-ambient and two high temperatures) were performed. The effect of moisture was evaluated by comparing 000- and 000+ data. This was done in two manners; by comparing the averages on a per-tunnel basis, and by using the %RH as a continuous variable. Using the per-tunnel method and comparing the means (in which the 000+ runs were labeled 'e' yet run in tunnel 'a') showed that humidity did

make a statistically significant difference (Figure 6 and Table 1) for three out of four statistical methods used.<sup>i</sup> The interpretation of Table 1 is that tunnels not connected by same letter were significantly different. Hence, c and e were not statistically significantly different, whereas e was statistically significantly different from tunnels a, k and l. (note - there were no 000 runs for tunnel d). In Figure 6, the data points are shown as dots; the 95% confidence interval is shown by the diamond. The colored circles in Figure 6 provide a visual depiction of whether or not two sample means are significantly different; circles that are nested or intersect greatly indicate that the sample means are not significantly different. The gray circles are significantly different from the red circles. The size of the circle represents the 95% confidence interval.

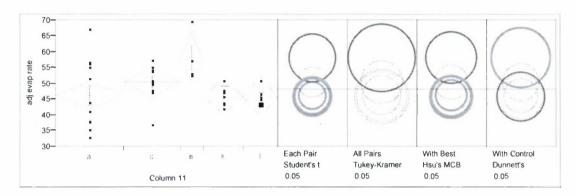


Figure 6. Comparison of 000+ Data (e) to 000- Data from the Other Tunnels

Table 1. Comparison of 000+ Data (e) to 000- Data from the Other Tunnels Based on the Student 't' Test

Tunnel	Statistical Grouping	Statistical Grouping	Mean
e	A		58.18
С	A	В	50.45
a		В	46.28
k		В	45.96
1		В	45.85

Tunnels not connected by same letter are significantly different

The other method consisted of adding the %RH for each run as a continuous variable, and performing a least squares fit with temperature, drop size, %HD remaining and %RH. With this treatment,  $r^2 = 0.91$ ,  $r^2_{adj} = 0.89$ , i and the significant factors for the evaporation

<sup>&</sup>lt;sup>1</sup> The explanations of the various tests and the assumptions made therein may be found in the JMP® Statistics and Graphics Guide Version 5, SAS Institute Inc., Cary, NC, pp 105-109.

ii r<sup>2</sup><sub>adj</sub> uses the degrees of freedom, and is useful for comparing datasets that have different sizes. The explanations of the various tests and the assumptions made therein may be found in the JMP® Statistics and Graphics Guide Version 5, SAS Institute Inc., Cary, NC, p 186.

rate were drop size and %HD remaining; the %RH was not a significant factor (Figure 7 and Table 2). Thus, in the analysis of the entire set of 150 points, which employed a least-squares method, the 000+ and 000- data were both treated as 000; a comparison of the least squares regression without the 000+ (i.e., 146 points) showed that the numerical results were not significantly affected by the deletion.

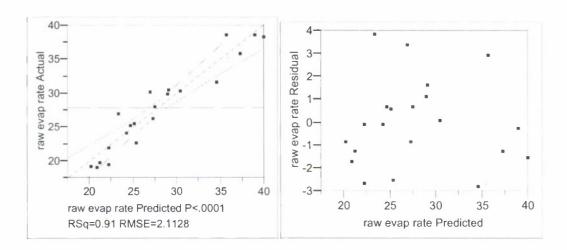


Figure 7. (a) Least Squares Fit for 000- and 000+ Data (b) Residuals

Table 2. Parameter Estimates from the Least Squares Fit for 000- and 000+ Data

Term	Estimate	Std Error	Prob> t
Intercept	51.16	33.44	0.1455
temp	-1.02	0.944	0.2969
drop size	3.29	0.9034	0.0022
%HD remaining	-0.36	0.033	<.0001
%RH	0.039	0.025	0.1413

#### 3.2 Variability between Tunnels

The variability between the different tunnels was evaluated from the 000- set of data using various statistical methods to compare the means. The Student t-test and Hsu's method (Figure 8, Table 3) showed that tunnels a and c were statistically significantly different; the Tukcy-Kramer and Dunnett's test did not. Thus, the tunnel identity was retained as a variable in the analysis of the data.

The explanations of the various tests and the assumptions made therein may be found in the JMP® Statistics and Graphics Guide Version 5, SAS Institute Inc., Cary, NC, pp 105-109.

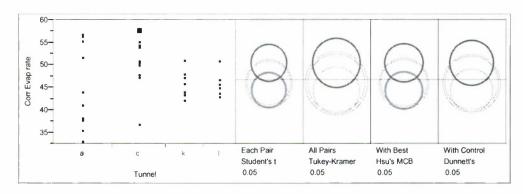


Figure 8. Comparison of Evaporation Rates from the Wind Tunnels Using Four Different Methods.

Table 3. Comparison of Means for Four Wind Tunnels Based on the Student 't' Test

Tunnel*	Statistical Grouping	Statistical Grouping	Mean
С	A		50.45
k	A	В	45.96
1	A	В	45.85
a		В	44.36

\*Tunnels not connected by same letter are significantly different

#### 3.3 Percentage HD Recovered

The recovery rates for sulfur mustard evaporation from glass were measured from the amounts of agent present on the thermal desorption tubes, which were calibrated daily using a 1-point continuing calibration verification (CCV) with a 15% tolerance. The %HD recovered averaged 86% with 90% of the data between 82 and 91% recovered; the full range was 0 to almost 200% (Figure 9). Given the tolerance on the CCV and the complexity of the instrumentation, all data were included in the analysis unless the least squares analysis indicated that they were 'outliers' – which was only the case for 3 of the 153 samples.

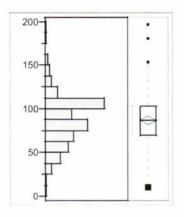


Figure 9. Distribution of the Percentage HD Recovered

#### 3.4 Analysis of the Entire Dataset

The average adjusted evaporation rates of HD on glass are depieted as a cube plot (Figure 10). The evaporation rate increased with temperature (°C), initial droplet mass (mg) and wind speed (in standard liters per minutes, SLPM); the data used are listed in Table A1.

A least squares fit of the data, which consisted of 150 evaporation rates at 22 different conditions, had an  $r^2 = 0.86$  and  $r^2_{adj} = 0.85$ , (Figure 11) and yielded the parameter estimates shown in Table 4. In other words, the evaporation rate of H from glass in a given tunnel may be calculated from eq 1:

```
Raw evaporation rate = (1)
-189.4 + (3.52 * "Temperature /C") + (4.95 * "drop mass /mg") + (0.184 * SLPM)
+ (0.551 * "%HD recovery")
+ Mateh(Tunnel, "a" -13.489; "e" -12.63; "d" 30.55; "k" -2.90)
+ [("Temperature /C"- 37.67) * ("drop mass /mg" - 6.99) * 0.274]
+ [("drop mass /mg") - 6.99) * (SLPM - 160.42) * 0.017]
+ [ ("Temperature /C" - 37.67) * (SLPM - 160.42) * 0.0073]
```

In the least squares fit, the raw evaporation rates and the %HD recovered were used, rather than the adjusted evaporation rates. The residual plot indicated that there were no major outlying points. The predicted values and standard deviation for each sample are listed in Appendix I, Table I-2. All of the factors except tunnel e and tunnel k had a Prob>|t| that was <0.0001, indicating that these factors were significantly contributing to the fit; tunnel l was the tunnel to which the others were compared. Tunnel c was also significant (Prob>|t| = 0.0003), yet tunnel k was not.

There was sufficient HD on glass data to test the model by splitting the data into two sets (a modeling set and a validation set). The model was run with the modeling set of data, and the predieted evaporation rates for the validation set of data were correctly ealculated. Likewise, the data was split into one set that eontained the vertiees and mid-point, and another set that eontained the balance. The parameters ealculated were similar to those obtained by using all 150 data points. Excluding the top two and bottom outliers for %HD recovered (Figure 9) resulted in an increase in r<sup>2</sup> of 0.01% and did not change the predieted values significantly. The ability to get similar predieted values of the raw evaporation rate by splitting the data into different sets illustrates the robustness of the data.

Although the predicted vs. aetual plot in Figure 11a has  $r^2 = 0.86$ , it does exhibit a slight curvature at the higher evaporation rates. Thus, the data were fit using the  $\log_{10}$  of the raw evaporation rate. This resulted in a better straight line fit with  $r^2 = 0.91$  (Figure 12), and eross factors were not important. The parameter estimates are given in Table 5. The justification for the use of a logarithmic fit may be found in Navaz et al.<sup>6</sup> Thus, the  $\log_{10}(\text{evaporation rate})$  may be ealeulated using eq 2:

$$log_{10}(evaporation \ rate) = -0.469 + (0.0249 * "Temperature /C") + (0.0502 * "drop \ mass /mg") + (0.00147 * SLPM) + (0.0051* "%HD \ recovery") + Match(Tunnel, "a", 0.0238, "c", 0.0189, "d", -0.284, "k", 0.154)$$
(2)

#### 4. CONCLUSIONS

A robust set of 150 wind tunnel experiments was generated from the evaporation of sulfur mustard (HD) on glass using the 5-cm wind tunnels coupled to thermal desorption tubes that were analyzed using gas chromatography/mass spectrometry detection (GC/MSD). Differences between the tunnels were noted for which the least squares analysis of the raw evaporation rate and log<sub>10</sub> (raw evaporation rate) could account. The factors that were initially determined - temperature, airflow, and drop size - were significant contributors to the concentration of HD vapors; humidity was not a major factor.

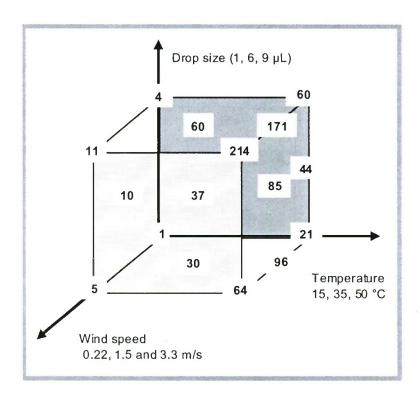


Figure 10. Cube Plot of the Adjusted Evaporation Rates of CASARM Sulfur Mustard from Glass as a Function of Temperature, Drop Size, and Airflow Rate

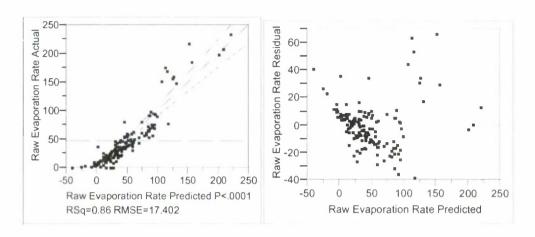
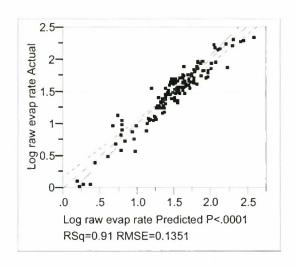


Figure 11. Model Fit for CASARM HD Evaporation Rates from Glass (a) as a Function of Temperature, Drop Size and Flow Rate, Tunnel, and %Sulfur Mustard Recovered (b) Residuals

Table 4. Parameter Estimates of the Major Factors for the Evaporation Rate of CASARM Grade Sulfur Mustard from Glass

Term	Estimate	Std Error	Prob> t
Intercept	-189.4	10.5	<.0001
Temperature/°C	3.52	0.224	<.0001
drop mass/mg	4.95	0.525	<.0001
SLPM (airflow rate)	0.184	0.0135	<.0001
(Temperature/°C-37.67)*(drop mass /mg-6.99)	0.274	0.0344	<.0001
(Temperature/°C-37.6711)*(SLPM-160.42)	0.0073	0.000902	<.0001
(drop mass/mg-6.99)*(SLPM-160.42)	0.017	0.003425	<.0001
%HD recovery	0.551	0.0516	<.0001
Tunnel[a] <sup>†</sup>	-13.48	2.89	<.0001
Tunnel[c] <sup>†</sup>	-12.63	3.42	0.0003
Tunnel[d] <sup>†</sup>	30.55	5.89	<.0001
Tunnel[k] <sup>†</sup>	-2.90	4.14	0.4842

<sup>†</sup>Compared to tunnel 1.



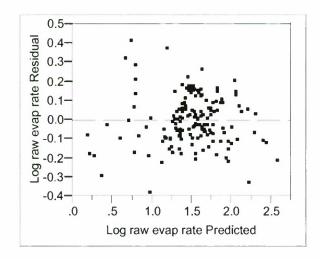


Figure 12. Model Fit for CASARM HD log<sub>10</sub>(Evaporation Rates) from Glass (a) as a Function of Temperature, Drop Size and Flow Rate, Tunnel, and %Sulfur Mustard Recovered (b) Residuals

Table 5. Parameter Estimates of the Major Factors for the log<sub>10</sub>(Evaporation Rate) of CASARM Grade Sulfur Mustard from Glass

Term	Estimate	Std Error	Prob> t
Intercept	-0.469	0.0816	<.0001
Temperature /°C	0.0249	0.00174	<.0001
drop mass /mg	0.0502	0.00407	<.0001
SLPM	0.00147	0.000102	<.0001
%HD recovery	0.00510	0.000401	<.0001
Tunnel[a]	0.0238	0.0224	0.2907
Tunnel[c]	0.0189	0.0265	0.4776
Tunnel[d]	-0.284	0.0457	<.0001
Tunnel[k]	0.154	0.0321	<.0001
(Temperature /C-37.6711)*(drop mass /mg-6.99195)	0.000244	0.000268	0.3633
(drop mass /mg-6.99195)*(SLPM-160.42)	0.0000108	0.000027	0.6856
(Temperature /C-37.6711)*(SLPM-160.42)	0.000009	0.000007	0.1988

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#### APPENDIX I

ENVIRONMENTAL FACTORS AND EVAPORATION RATES FOR INDIVIDUAL EXPERIMENTS

Table I-1. Wind Tunnel Variables and Evaporation Rates

run #	ТМАН	Temp (°C)	drop mass	Airflow (SLPM)	%HD mass	raw evap	adj evap	tunnel	avg raw	avg adj	stdev raw	stdev adj
		( )	(mg)	(OLI IVI)	recov	rate	rate		evap	evap	1a w	auj
3a81	+-0-	50.1	1.35	182	71.4	44.4	62.2	a		- · F		
3c47	+-0-	50	1.21	182	68	30.4	44.7	С				
3k019	+-0-	49.8	1.29	182	76.8	81	105.5	k				
31018	+-0-	50.7	1.29	182	182.6	152	83.2	1				
3k020	+-0-	51.3	1.29	182	198.7	170	85.6	k	95.56	76.23	62.85	23.36
3a05	000-	35.8	7.13	181	89.5	31.8	35.5	a				
3a06	000-	36	7.07	181	93.9	38.7	41.2	a				
3a07	000-	35.4	7.05	181	101.3	38.7	38.2	a				
3a15	000-	34.9	5.2	181	77	25.4	33.0	a				
3a16	000-	35	7.21	182	101.8	38.5	37.8	a				
3a21	000-	35	7.12	182	94.8	36	38.0	a				
3c128	000-	35.9	8.1	180	59.5	30.3	50.9	С				
3k001	000-	35.1	7.75	181	70.3	30.5	43.4	k				
3c129	000-	34.7	7.9	181	59.6	28.2	47.3	С				
3k002	000-	34.6	7.75	182	60	26.4	44.0	k				
3c130	000-	34.3	8.16	182	60.2	30.1	50.0	c				
3k003	000-	34.2	7.75	182	64	30.7	48.0	k				
3c135	000-	35.3	8.09	182	50.5	24.2	47.9	c				
3k008	000-	34.7	7.75	182	54.3	25.7	47.3	k				
3a097	000-	34.8	8.12	182	51.7	22.8	44.1	a				
31005	000-	35.1	7.75	182	46.4	21.7	46.8	1				
3c146	000-	35.2	8.13	182	38.3	19.3	50.4	c				
31008	000-	34.8	7.75	182	42.5	19.1	44.9	1				
31009	000-	35	7.75	182	42.9	18.8	43.8	1				
3a143	000-	34.8	7.91	182	86.6	49.2	56.8	a				
3c180	000-	35	8.01	181	101.7	54.9	54.0	c				
3a144	000-	34.8	7.92	182	98.5	54.5	55.3	a				
3c181	000-	34.3	8.14	181	108.6	59.1	54.4	c				
3a145	000-	34.7	7.96	182	70.3	47.3	67.3	a				
3c182	000-	34.6	7.75	182	99.9	55.1	55.2	c				
3k042	000-	34.7	7.75	182	67.4	34.4	51.0	k				
31040	000-	35.2	7.75	182	64	32.6	50.9	1				
3a146	000-	34.8	7.75	182	92.7	47.9	51.7	a				
3c183	000-	34.7	7.93	182	106	60.9	57.5	c				
3k043	000-	35	7.75	182	107.1	45.2	42.2	k				
31041	000-	35	7.75	182	120	54.8	45.7	1				
3a147	000-	34.9	7.56	182	72.9	41.1	56.4	a				
3c184	000-	34.9	5.5	182	86.2	31.8	36.9	c				
3k044	000-	35	7.61	182	109.8	50.3	45.8	k				
31042	000-	35.1	7.61	182	101.1	43.5	43.0	1	37.13	47.33	12.47	7.33
3a099	000+	35.9	8.06	182	41.43	22.1	53.3	a				
3a101	000+	34.3	8.03	182	39.1	27.2	69.6	a				
3a103	000+	34.9	8.04	182	34.7	19.9	57.3	a				
3a104	000+	34.8	8.06	182	37.3	19.6	52.5	a	22.20	58.20	3.51	7.86
3a001	00	35.2	7.08	14.9	61.9	10.5	17.0	a		20.20		
3a002	00	36.5	7.17	14.6	75.3	13.7	18.2	a				
3a003	00	35.1	7.06	15	85.6	13	15.2	a				
3a004	00	35.1	7.23	14.6	97.6	23.1	23.7	a				
			0		- 1.0							

Table I-1. Wind Tunnel Variables and Evaporation Rates (Continued)

3a008	00	35	7.13	13.9	105.9	20.2	19.1	a				
3a009	00	35.2	7.13	14	106.3	19.7	18.5	a				
3a010	00	35.4	7.17	14.2	110	26.9	24.5	a				
3a011	00	35.2	7.16	14.1	103.6	18.6	18.0	a				
3a014	00	36.1	7.08	14	106.7	24.8	23.2	a				
3a037	00	34.7	7.12	18	110.1	15.8	14.4	a				
3c002	00	35.8	7.13	18	57.6	8.1	14.1	С				
3a038	00	34.2	7.26	18.1	104.6	15.5	14.8	a				
3c004	00	35.6	7.29	18	139	23.5	16.9	С				
3c005	00	35	7.11	18	128.1	26.2	20.5	С				
3a041	00	33.9	7.22	18	77.6	37.3	48.1	a				
3c006	00	35	7.12	18	80.7	11.8	14.6	С				
31007	00	35.2	7.75	18.7	10.1	3.9	38.6	1	18.39	21.13	8.19	9.12
3a068	0+0-	34.9	11.68	181	141	92	65.2	a				
3c030	0+0-	35.11	11.68	182	155.2	94.1	60.6	С				
3c075	0+0-	35.3	11.53	161	73.5	44.3	60.3	С				
3c037	0+0-	35.7	11.4	182	76.8	41.2	53.6	С				
3a076	0+0-	35.3	11.48	182	83	48.2	58.1	a				
3c038	0+0-	34.2	11.37	182	71.9	38.6	53.7	С	59.73	58.59	26.01	4.47
3a019	00+-	35.6	7.37	432	101.8	56.8	55.8	a				
3a020	00+-	35.3	7.15	432	113.5	77	67.8	a				
3c145	00+-	35.1	8.12	405	43.1	30.9	71.7	С	54.90	65.11	23.11	8.29
3k017	0-0-	33.9	1.29	181	110.7	32.3	29.2	k				
31015	0-0-	35.2	1.29	181	115.2	34.5	29.9	1				
3k018	0-0-	34.8	1.29	181	120	45.3	37.8	k				
31016	0-0-	35.2	1.29	181	130.6	44.1	33.8	1				
3k021	0-0-	35.2	1.29	181	103.5	34.7	33.5	k				
31019	0-0-	36.5	1.29	182	102	37.2	36.5	1				
3a66	0-0-	35.1	1.31	182	92	13.9	15.1	a				
3c21	0-0-	35.2	1.37	182	81.2	12.4	15.3	С				
3a74	0-0-	35.9	1.38	182	72.5	11.9	16.4	a	29.59	27.49	13.36	9.33
3d009	-00-	15.1	7.8	182	31.4	2.6	8.3	d				
3d027	-00-	15.5	7.72	182	100.7	10.3	10.2	d				
3d031	-00-	15.5	7.58	182	89.6	14.2	15.8	d				
3d034	-00-	14.9	7.6	182	102.8	11.9	11.6	d				
3d036	-00-	15.2	7.62	181	77.8	9.8	12.6	d				
3d074	-00-	15.6	5.61	181	118.6	8.6	7.3	d	9.57	10.96	3.92	3.11
3d006		15.6	1.7	18.1	73.1	1.3	1.8	d				
3d024		15.4	1.3	18.1	92.4	1.2	1.3	d				
3d022	'	15.1	1.23	18.1	84.9	1.1	1.3	d	1.20	1.46	0.10	0.28
3c028	+00-	49.8	7.81	182	113.9	177	155.4	С				
3a073	+00-	49.6	7.52	182	87.5	96.5	110.3	a				
3c032	+00-	48.9	7.56	182	77.7	93.4	120.2	С				
3a077	+00-	50.1	7.7	182	80	96.7	120.9	a				
3c040	+00-	49	7.69	182	68.3	67.5	98.8	С				
3a080	+00-	50.3	7.42	182	72.9	99.4	136.4	a				
3c046	+00-	50.5	7.67	182	70.3	76.4	108.7	С				
3c136	+00-	49.9	8.1	181	57.4	73	127.2	С				
3k009	+00-	50.9	7.75	182	57.3	70.6	123.2	k				
3c138	+00-	50.1	8.09	182	51	59.4	116.5	С				
3k011	+00-	49.7	7.75	181	60.1	71.1	118.3	k				
3c140	+00-	49.7	7.91	182	54.3	62.1	114.4	С				

Table I-1. Wind Tunnel Variables and Evaporation Rates (Continued)

3c142	+00-	49.2	7.95	181	46.4	61.7	133.0	c				
31013	+00-	50.5	7.75	182	63.5	91.1	143.5	1	85.42	123.3	29.99	14.85
3a031	+0	48.8	7.22	18	99.7	40.1	40.2	a				
3a032	+0	48.5	6.98	18	102.4	48.4	47.3	a				
3a033	+0	50	7.13	18	103.2	51.3	49.7	a				
3a034	+0	48.3	7.32	18	95.2	38.5	40.4	a				
3a035	+0	48.3	7.09	18	94.3	34.1	36.2	a				
3c007	+0	47.6	7.18	18	100.8	39.2	38.9	c				
3c009	+0	48.6	7.21	18	113.5	37.9	33.4	c				
3c011	+0	48.4	7.37	18	101.4	41.1	40.5	c				
3a051	+0	50.7	7.84	18.1	100	47.4	47.4	a				
3a053	+0	50.5	7.145	18.1	100	41.7	41.7	a				
3a054	+0	51	7.197	18.1	100	60	60.0	a				
3a056	+0	51.2	7.61	18.1	100	63.3	63.3	a				
3c012	+0	48.2	7.02	18	118.4	47.4	40.0	c				
3c013	+0	48.4	7.41	18	83	35	42.2	c				
3c014	+0	48.65	7.25	18	92.4	46.1	49.9	c				
3c015	+0	48.8	7.24	18	70.7	36.1	51.1	c				
3a055	+0	51.1	7.58	18	60.2	37.6	62.5	a	43.84	46.15	8.40	8.99
3c016	+0x-	50.3	7.78	50.2	108.7	81.9	75.3	c				
3c052	+0+-	49.7	7.59	406	80.9	185.8	229.7	c				
3d011	+-	14.9	1.4	403	23.7	1.2	5.1	d				
3d028	+-	15.9	1.35	406	109.1	5.7	5.2	d				
3d033	+-	15.1	1.37	406	87.5	5.1	5.8	d				
3d035	+-	14.9	1.34	406	103.1	7	6.8	d	4.75	5.73	2.50	0.78
3d007	-+	15.8	11.74	18	103.2	4.1	4.0	d				
3d023	-+	15.6	10.08	18	81.8	3.2	3.9	d	3.65	3.94	0.64	0.04
3a061	+	49	1.19	18	138	22.3	16.2	a				
3a064	+	49.2	1.34	18	128.3	24.1	18.8	a				
3a084	+	49.5	1.51	18	86.6	18.2	21.0	a				
3c050	+	49.7	1.59	18	83.2	18.4	22.1	a	20.75	19.52	2.92	2.63
3c026	++0-	49.8	11.46	181	127.3	218	171.2	c				
3a079	++0-	50.7	11.45	182	81.8	148.7	181.8	C				
3c045	++0-	50.1	11.55	182	75.9	160.7	211.7	c				
3c051	++0-	49.7	11.37	182	81.3	156.8	192.9	С	171.1	189.4	31.70	17.30
3d010	-++-	15.1	11.71	405	46.9	9.9	21.1	d				
3d016	-++-	15.2	11.7	406	100	12.4	12.4	d				
3d017	-++-	15.1	11.58	406	37.4	7.9	21.1	d				
3d026	-++-	15.5	11.42	406	102.4	18.2	17.8	d				
3d032	-++-	15.3	11.49	406	81.1	12.9	15.9	d		4-64		
3d037	-++-	15.2	12.1	406	38.2	6	15.7	d	11.22	17.34	4.31	3.40
3c022	+-+-	50.3	1.21	398	151.8	78.7	51.8	С				
3c041	+-+-	49.8	1.28	404	95.7	54.6	57.1	С	(2.55	(0.10	12.10	10.10
3c043	+-+-	50	1.32	405	80.4	57.4	71.4	c	63.57	60.10	13.18	10.12
3a063	++	49.6	11.44	18	84.2	43.6	51.8	a				
3a083	++	49.5	11.85	18	110	65.4	59.5	a	50.05	50.65	14.22	( 50
3c049	++	50	11.69	18	109.1	70.6	64.7	С	59.87	58.65	14.33	6.50
3c042	+++-	50	11.49	404	74.2	199	268.2	С				
3c044	+++=	50.1	11.38	405	108.5	233.9	215.6	c		2-2-	4= 6=	21 50
3c053	+++-	50.1	11.81	406	76.7	209.2	272.8	С	214.0	252.2	17.95	31.78

Table I-2. Results of Evaporation Rate Least Squares Fit

			2. Results of	L'aporation Rai	e Louist Squar	CS I It	
Code	TMAH	%HD	Raw	Raw Predicted	Std Err Pred	Log raw	Pred Formula
		recovery	Evaporation	from all points	from all	evap rate	Log raw evap
			Rate		points		rate
2 01		71.4		22.50		1 ( 1	
3a81	+-0-	71.4	44.4	33.58	5.25	1.65	1.49
3c47	+-0-	68	30.4	31.13	5.50	1.48	1.46
3k019	+-0-	76.8	81	45.98	6.16	1.91	1.64
31018	+-0-	182.6	152	107.49	7.67	2.18	2.13
3k020	+-0-	198.7	170	116.24	7.69	2.23	2.29
3a05	000-	89.5	31.8	40.66	2.78	1.50	1.53
3a06	000-	93.9	38.7	43.53	2.79	1.59	1.55
3a07	000-	101.3	38.7	45.30	2.93	1.59	1.57
3a15	000-	77	25.4	21.69	3.04	1.40	1.35
3a16	000-	101.8	38.5	45.00	2.98	1.59	1.58
3a21	000-	94.8	36	40.73	2.88	1.56	1.54
3c128	000-	59.5	30.3	29.84	3.26	1.48	1.42
3k001	000-	70.3	30.5	40.93	4.90	1.48	1.57
3c129	000-	59.6	28.2	24.43	3.42	1.45	1.38
3k002	000-	60	26.4	33.49	5.01	1.42	1.51
3c130	000-	60.2	30.1	24.51	3.45	1.48	1.39
3k003	000-	64	30.7	34.14	4.98	1.49	1.52
3c135	000-	50.5	24.2	22.84	3.52	1.38	1.36
3k008	000-	54.3	25.7	30.75	5.08	1.41	1.48
3a097	000-	51.7	22.8	20.79	3.28	1.36	1.36
31005	000-	46.4	21.7	29.33	5.42	1.34	1.39
3c146	000-	38.3	19.3	15.91	3.86	1.29	1.30
31008	000-	42.5	19.1	26.02	5.49	1.28	1.36
31009	000-	42.9	18.8	27.02	5.48	1.27	1.37
3a143	000-	86.6	49.2	39.05	2.88	1.69	1.53
3c180	000-	101.7	54.9	49.28	3.33	1.74	1.61
3a144	000-	98.5	54.5	45.65	2.99	1.74	1.59
3c181	000-	108.6	59.1	50.88	3.56	1.77	1.63
3a145	000-	70.3	47.3	29.91	2.95	1.67	1.45
3c182	000-	99.9	55.1	45.72	3.37	1.74	1.58
3k042	000-	67.4	34.4	37.96	4.93	1.54	1.55
31040	000-	64	32.6	39.41	5.21	1.54	
3a146	000-	92.7	47.9	41.68	2.91	1.51	1.48
3c183	000-	106	60.9				1.55
3k043	000-		45.2	50.28	3.45	1.78	1.62
		107.1		60.97	5.02	1.66	1.76
31041	000-	120	54.8	69.45	5.58	1.74	1.76
3a147	000-	72.9	41.1	30.31	2.89	1.61	1.44
3c184	000-	86.2	31.8	29.11	3.50	1.50	1.40
3k044	000-	109.8	50.3	61.82	5.04	1.70	1.77
31042	000-	101.1	43.5	58.79	5.27	1.64	1.66
3a099	000+	41.43	22.1	19.23	3.52	1.34	1.33
3a101	000+	39.1	27.2	11.47	3.66	1.43	1.28
3a103	000+	34.7	19.9	11.47	3.78	1.30	1.27
3a104	000 +	37.3	19.6	12.60	3.70	1.29	1.28
3a001	00	61.9	10.5	-4.88	3.29	1.02	1.13
3a002	00	75.3	13.7	5.86	2.94	1.14	1.23
3a003	00	85.6	13	7.90	2.98	1.11	1.25

Table I-2. Results of Evaporation Rate Least Squares Fit (Continued)

			1	1		,	
3a004	00	97.6	23.1	14.74	3.02	1.36	1.32
3a008	00	105.9	20.2	18.77	3.11	1.31	1.35
3a009	00	106.3	19.7	19.50	3.10	1.29	1.36
3a010	00	110	26.9	22.14	3.14	1.43	1.38
3a011	00	103.6	18.6	18.09	3.06	1.27	1.34
3a014	00	106.7	24.8	21.85	3.00	1.39	1.38
3a037	00	110.1	15.8	20.99	3.19	1.20	1.37
3c002	00	57.6	8.1	-4.27	4.14	0.91	1.12
3a038	00	104.6	15.5	16.95	3.18	1.19	1.34
3c004	00	139	23.5	40.35	4.61	1.37	1.54
3c005	00	128.1	26.2	32.49	4.39	1.42	1.46
3a041	00	77.6	37.3	1.25	3.17	1.57	1.19
3c006	00	80.7	11.8	6.42	3.91	1.07	1.22
31007	00	10.1	3.9	-19.51	6.76	0.59	0.97
3a068	0+0-'	141	92	86.30	4.96	1.96	1.99
3c030	0+0-'	155.2	94.1	96.25	5.45	1.97	2.07
3c075	0+0-'	73.5	44.3	46.42	3.55	1.65	1.62
3c037	0+0-'	76.8	41.2	54.69	3.40	1.61	1.67
3a076	0+0-'	83	48.2	55.67	3.56	1.68	1.70
3c078	0+0-'	71.9	38.6	44.54	3.60	1.59	1.60
3a019	00+-	101.8	56.8	91.92	5.08	1.75	1.96
3a020	00+-	113.5	77	94.73	5.26	1.89	2.00
3c145	00+-	43.1	30.9	59.27	4.62	1.49	1.64
3k017	0-0-	110.7	32.3	30.99	5.40	1.51	1.43
31015	0-0-	115.2	34.5	37.58	5.68	1.54	1.42
3k018	0-0-	120	45.3	38.00	5.42	1.66	1.50
31016	0-0-	130.6	44.1	46.06	5.90	1.64	1.50
3k021	0-0-	103.5	34.7	29.76	5.25	1.54	1.42
31019	0-0-	102	37.2	33.13	5.51	1.57	1.38
3a66	0-0-	92	13.9	12.80	4.04	1.14	1.23
3c21	0-0-	81.2	12.4	8.20	4.75	1.09	1.18
3a74	0-0-	72.5	11.9	4.10	4.12	1.08	1.16
3d009	-00-	31.4	2.6	-24.55	5.04	0.41	0.43
3d027	-00-	100.7	10.3	15.21	4.35	1.01	0.79
3d031	-00-	89.6	14.2	9.21	4.24	1.15	0.73
3d034	-00-	102.8	11.9	14.16	4.35	1.08	0.78
3d034	-00-	77.8	9.8	1.50	4.25	0.99	0.66
3d074	-00-	118.6	8.6	27.01	4.54	0.93	0.79
3d006	'	73.1	1.3	15.57	8.10	0.11	0.19
3d024	'	92.4	1.2	27.40	8.39	0.08	0.26
3d022	'	84.9	1.1	23.25	8.49	0.04	0.21
3c028	+00-	113.9	177	112.96	3.15	2.25	2.04
3a073	+00-	87.5	96.5	94.31	3.53	1.98	1.89
3c032	+00-	77.7	93.4	87.43	2.82	1.97	1.82
3a077	+00-	80	96.7	93.66	3.66	1.99	1.87
3c040	+00-	68.3	67.5	83.73	2.96	1.83	1.78
3a080	+00-	72.9	99.4	88.07	3.73	2.00	1.83
3c046	+00-	70.3	76.4	90.46	3.73	1.88	1.83
3c136	+00-	57.4	73	84.47	3.09	1.86	1.77
3k009	+00-	57.3	70.6	95.29	5.29	1.85	1.77
3c138	+00-	51	59.4	81.95	3.48	1.83	1.74
3k011	+00-	60.1	71.1	91.89	5.65		1.74
SKUTT	+00-	00.1	/1.1	71.89	2.03	1.85	1.89

APPENDIX I

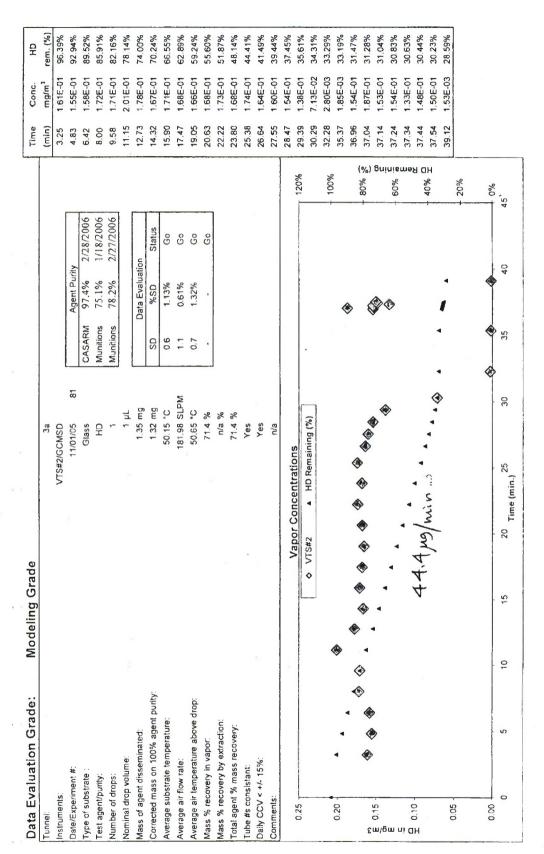
Table I-2.	Results of Evaporation	Rate Least Sc	quares Fit	(Continued)
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	140	ie i 2. Results of	Lyaporation	tate Least Square.	s i it (Contin	iucu)	
3c140	+00-	54.3	62.1	80.63	3.35	1.79	1.74
3c142	+00-	46.4	61.7	74.37	3.53	1.79	1.68
31013	+00-	63.5	91.1	98.53	6.10	1.96	1.86
3a031	+0	99.7	40.1	51.24	3.33	1.60	1.66
3a032	+0	102.4	48.4	50.63	3.27	1.68	1.65
3a033	+0	103.2	51.3	55.67	3.52	1.71	1.70
3a034	+0	95.2	38.5	48.04	3.26	1.59	1.63
3a035	+0	94.3	34.1	46.28	3.23	1.53	1.61
3c007	+0	100.8	39.2	49.44	3.71	1.59	1.63
3c009	+0	113.5	37.9	59.12	3.91	1.58	1.72
3c011	+0	101.4	41.1	52.83	3.78	1.61	1.66
3a051	+0-	100	47.4	60.06	3.74	1.68	1.73
3a053	+0-	100	41.7	55.29	3.58	1.62	1.69
3a054	+0-	100	60	56.87	3.67	1.78	1.71
3a056	+0-	100	63.3	59.97	3.77	1.80	1.73
3c012	+0	118.4	47.4	59.77	3.96	1.68	1.72
3c013	+0	83	35	42.93	3.79	1.54	1.57
3c014	+0	92.4	46.1	47.86	3.79	1.66	1.61
3c015	+0	70.7	36.1	36.24	3.99	1.56	1.50
3a055	+0	60.2	37.6	37.58	4.15	1.58	1.53
3c016	+0x-	108.7	81.9	73.56	3.68	1.91	1.81
3c052	+0+-	80.9	185.8	155.78	5.20	2.27	2.21
3d011	+-	23.7	1.2	-40.32	8.41	0.08	0.37
3d028	+-	109.1	5.7	10.08	7.89	0.76	0.83
3d033	+-	87.5	5.1	-4.77	7.90	0.71	0.70
3d035	+-	103.1	7	2.98	8.03	0.85	0.77
3d007	-+	103.2	4.1	-2.07	9.33	0.61	0.78
3d023	-+	81.8	3.2	-8.82	8.03	0.51	0.59
3a061	+	138	22.3	38.64	5.99	1.35	1.55
3a064	+	128.3	24.1	34.34	5.80	1.38	1.51
3a084	+	86.6	18.2	12.65	5.74	1.26	1.31
3c050	+	83.2	18.4	11.44	5.75	1.26	1.30
3c026	++0-	127.3	218	151.50	4.69	2.34	2.30
3a079	++0-	81.8	148.7	131.13	4.09	2.17	2.09
3c045	++0-	75.9	160.7	125.81	4.02	2.21	2.05
3c051	++0-	81.3	156.8	125.27	3.87	2.20	2.06
3d010	-++-	46.9	9.9	2.53	6.58	1.00	
3d016	-++-	100	12.4	32.49	6.70	1.09	0.98
3d017	-++-	37.4	7.9	-2.97	6.63	0.90	1.26
3d026	-++-	102.4	18.2	34.95	6.53		0.93
3d032	_++_	81.1	12.9	22.13	6.39	1.26	1.26
3d037	-++-	38.2	6	-0.36	6.90	1.11 0.78	1.15
3c022	+-+-	151.8	78.7	116.77			0.96
3c041	+-+-	95.7	54.6	85.98	8.12	1.90	2.22
3c041	+-+-	80.4	57.4	85.98 78.98	7.78 7.92	1.74	1.93
3a063	++	84.2	43.6	69.35		1.76	1.86
3a083	++	110	65.4		5.34	1.64	1.81
3c049	++	109.1		85.56 86.87	5.76	1.82	1.96
3c049	+++-	74.2	70.6	86.87	5.50	1.85	1.96
3c042	+++-		199	201.55	6.95	2.30	2.40
3c044		108.5	233.9	220.06	7.22	2.37	2.57
30033	+++=	76.7	209.2	208.27	7.25	2.32	2.44

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APPENDIX II
WIND TUNNEL DATA

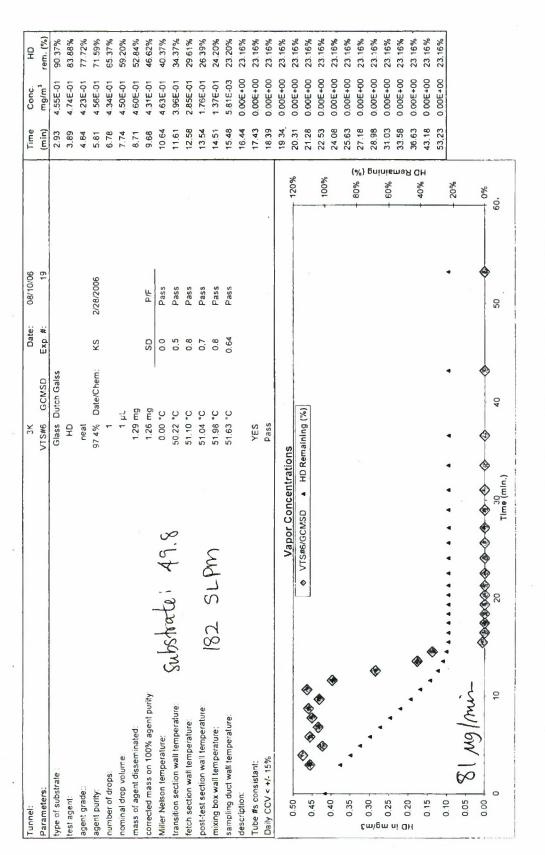


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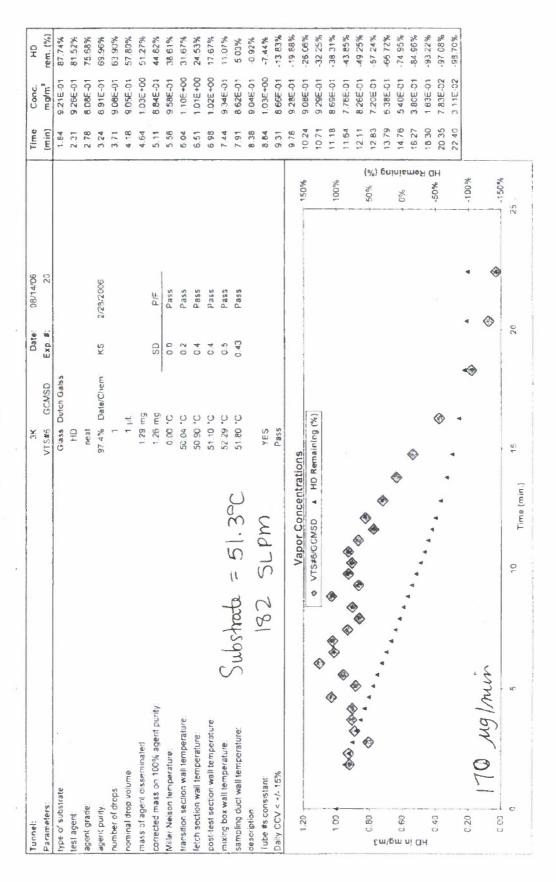
Data Evaluation Grade:		Modeling Grade							Time	Conc.	HD
Tunnel:				36					(min)	ma/m <sub>3</sub>	rem. (%)
Instruments			VTS#1/GCMSD	MSD					3.70	2.05E-01	94.15%
Date/Experiment #			11/0	11/01/05 47		Agent Purity			5.28	1.51E-01	89.81%
Type of substrate:			0	Glass	CASARM	97.4%	2/28/2006		6.87	1.55E-01	86.07%
Test agent/purity:				무	Munitions	75.1%	1/18/2006		8.45	1.53E-01	82.31%
Number of drops:				-	Munitions	78.2%	2/27/2006		10.05	1.59E-01	78.46%
Nominal drop volume:				1 µL					11.65	1.63E-01	74.48%
Mass of agent disseminated:				1.21 т.д		Data Evaluation	on		13.23	1.79E-01	70.31%
Corrected mass on 100% agent purity.	ent purity:			1.18 mg	SD	%SD	Status		14.82	1.66E-01	66.10%
Average substrate temperature:	Jre:		2	2, 90 09	6.0	1.73%	Go		16.40	1.86E-01	61.81%
Average air flow rate:			18	181.70 SLPM	1.4	%62.0	Go		17.98	1.58E-01	57.61%
Average air temperature above drop:	ve drop:		5	50.47 °C	0.7	1.48%	Go		19.58	1.64E-01	53.64%
Mass % recovery in vapor:				68.0 %	*	4	Go		21.17	1.64E-01	49.63%
Mass % recovery by extraction:	on:			n/a %					22.75	1.78E-01	45.45%
Total agent % mass recovery:				68.0 %					24.33	1.54E-01	41.40%
Tube #s consistant:				Yes					25.92	1.51E-01	37.68%
Daily CCV < +/- 15%:				Yes					27.50	1.18E-01	34.40%
Comments:				п/а					29.08	2.68E-02	32.63%
		Toll.	010000000000000000000000000000000000000						30.35	4.82E-03	32.32%
0.25		11.	S COUCE					7 120%	31.27	4.93E-03	32.26%
		#01A	A HD Remaining (%)	ng (%)					33.28	1.89E-03	32.15%
•								+ 100%	36.37	1.60E-03	32.07%
0.20		4							37.96	0.00E+00	32.05%
		•	•						38.06	0.00E+00	32.05%
5	•	*** ***	**					%)	38.16	0.00E+00	32.05%
n D JulyB		•	*					6ul	38.26	0.00E+00	32.05%
w t		<b>▼</b>		•				+ 60% nls	38.36	0.00E+00	32.05%
(C)	C		•	Ď				mə5	38.46	0.00E+00	32.05%
Н	405	4 Mg/min.	<b>▼</b>					40%	38.56	0.00E+00	32.05%
			■ .	4	•	•			38.66	0.00E+00	32.05%
CCC				4	•	1	1		40.25	0.00E+00	32.05%
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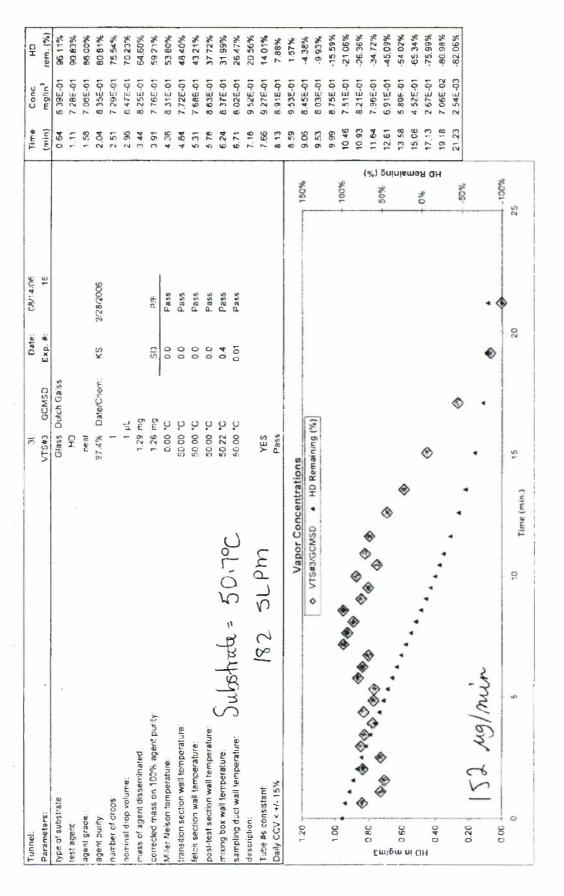
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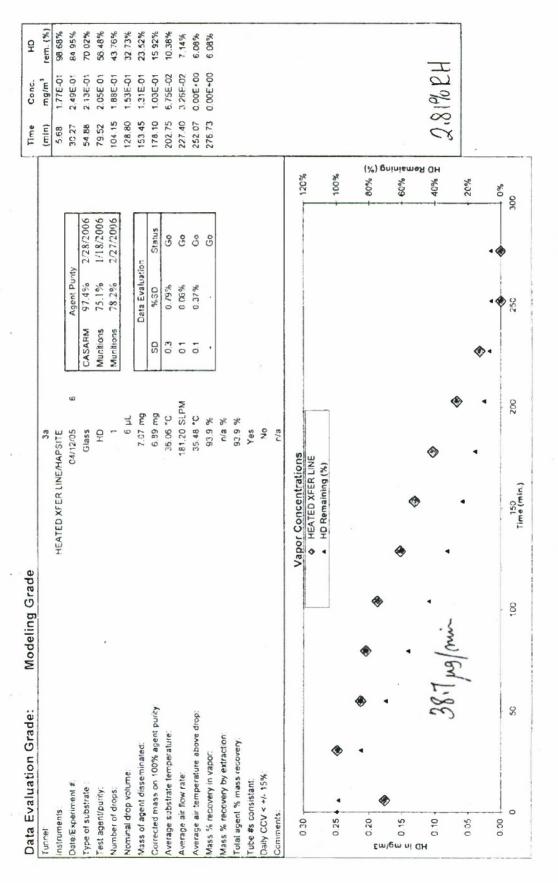


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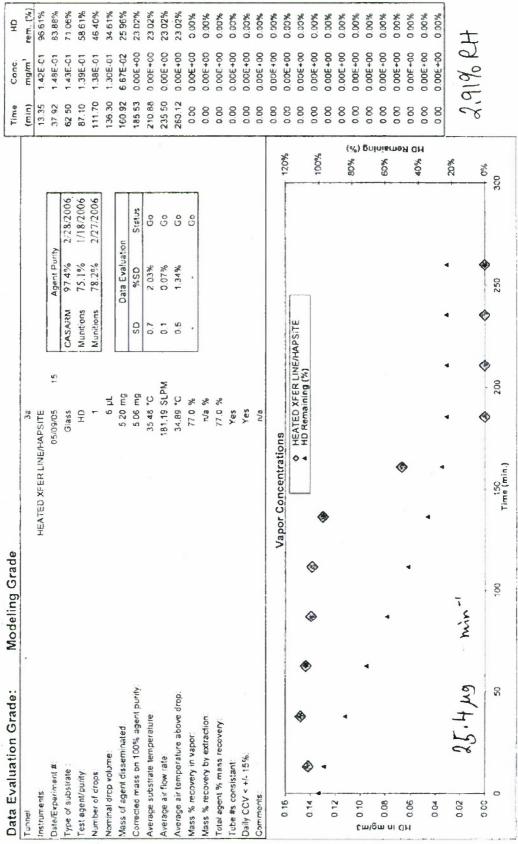
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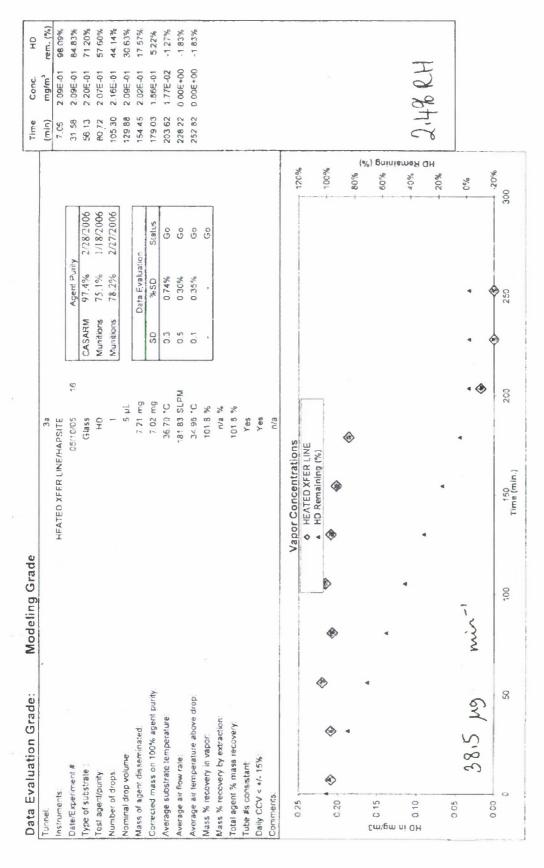
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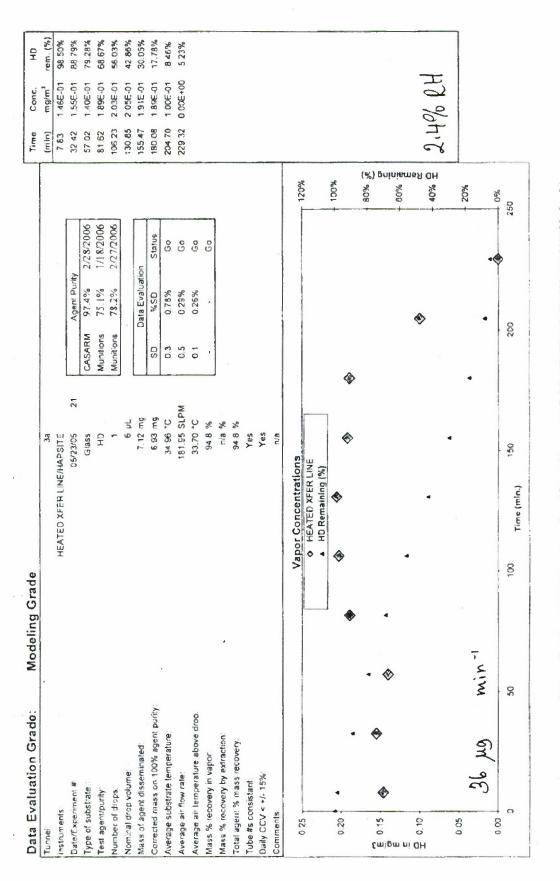
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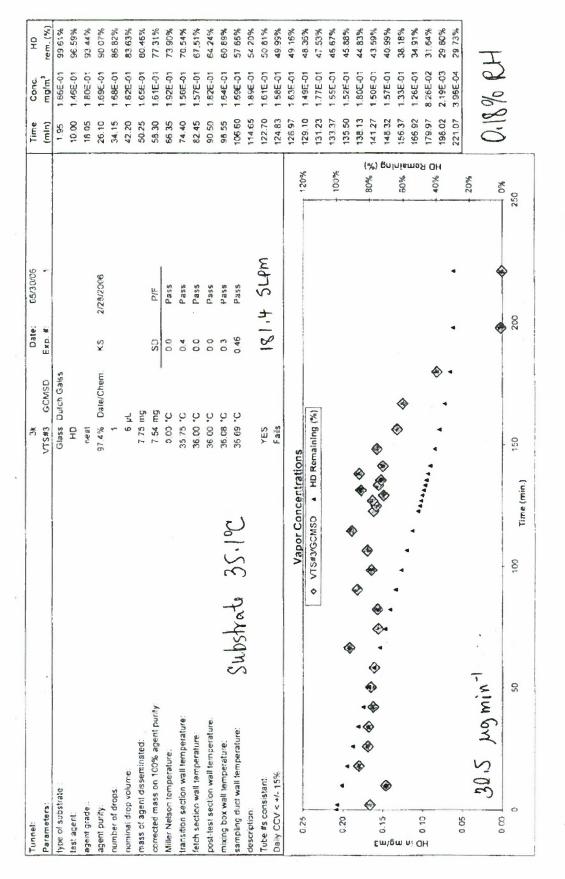
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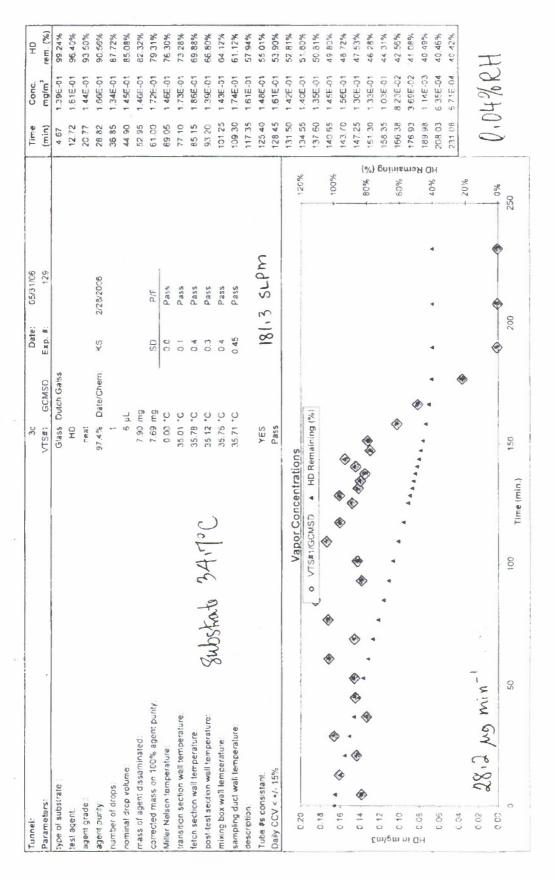
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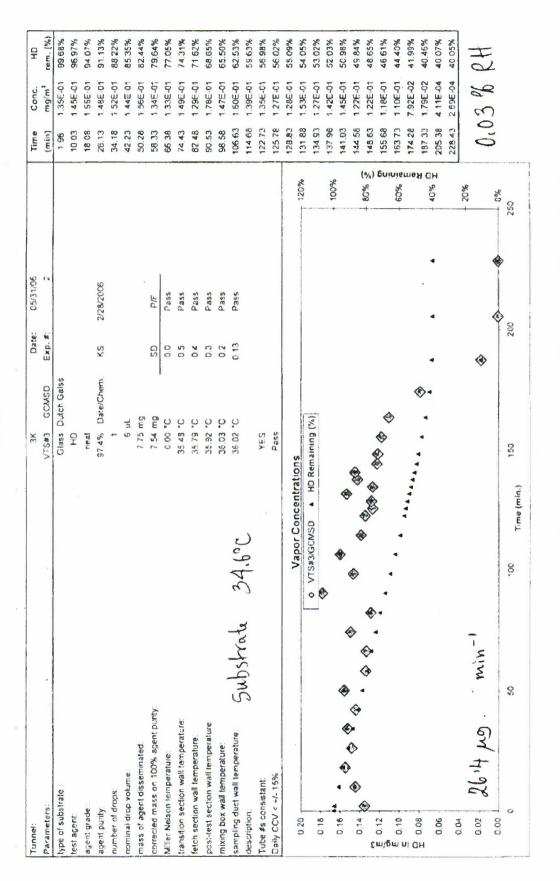


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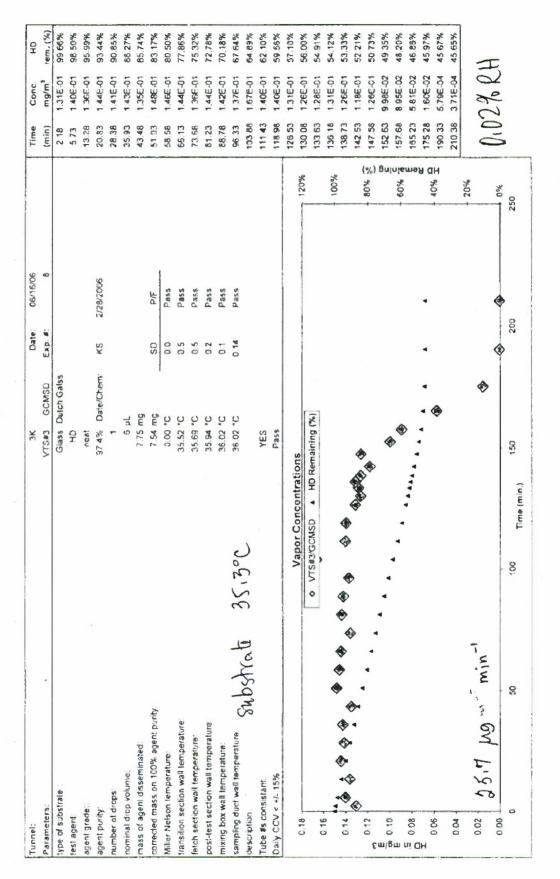
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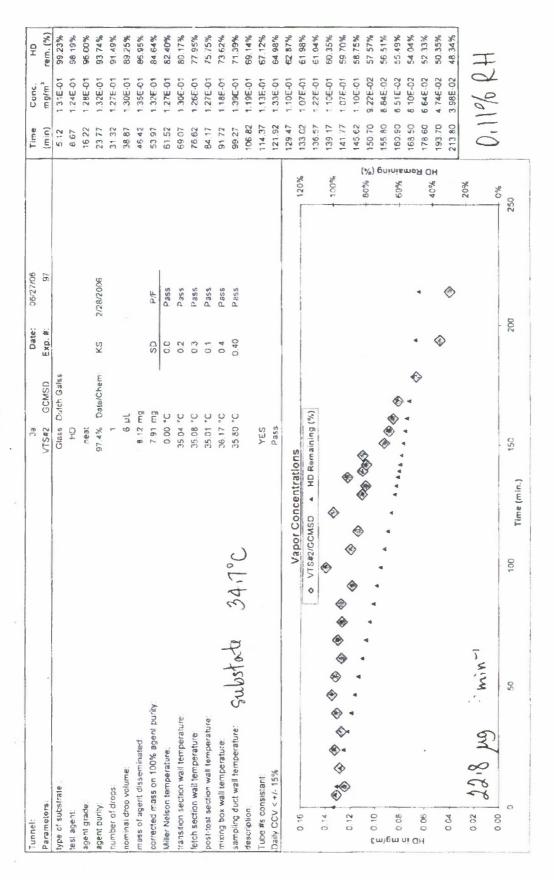
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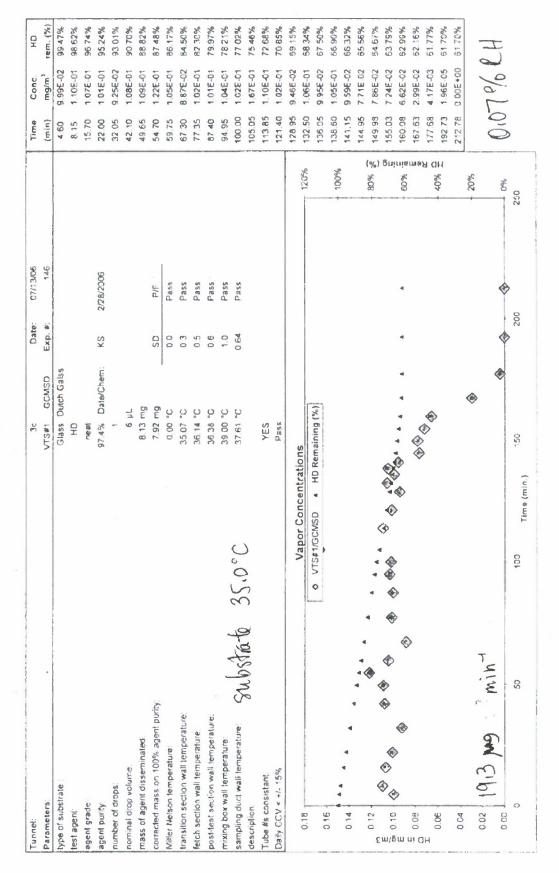


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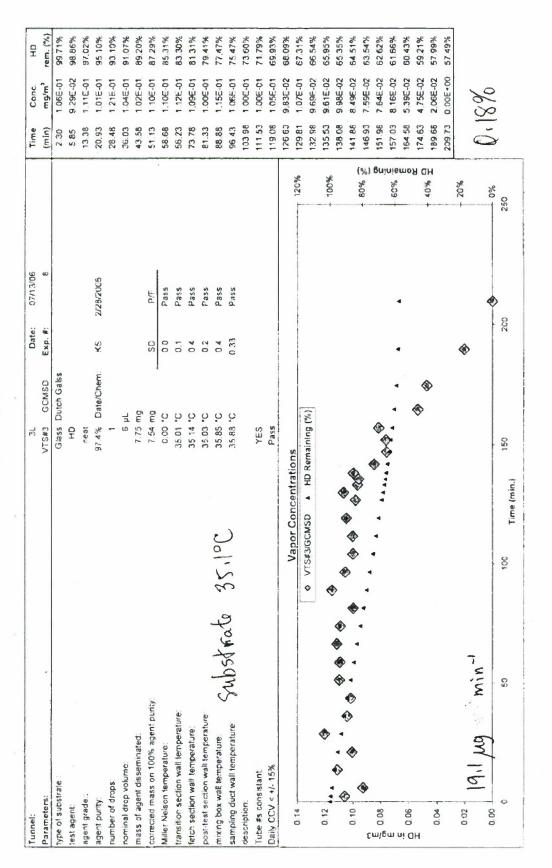
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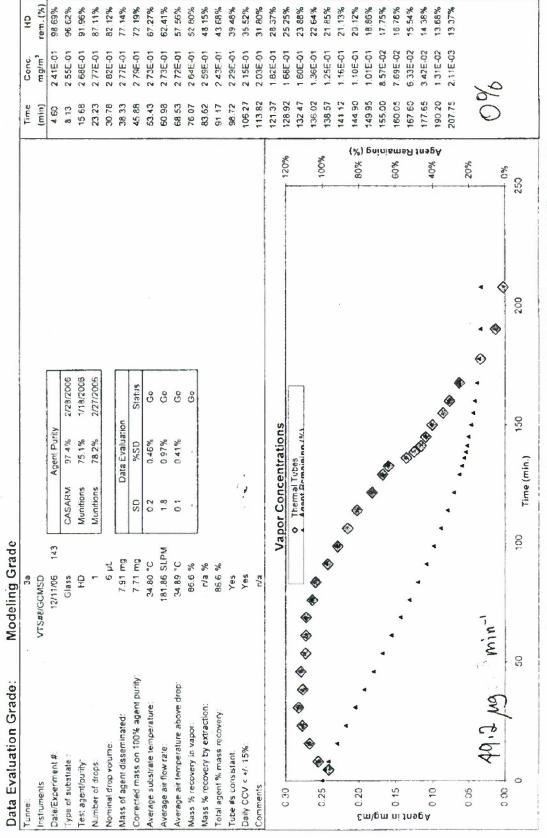
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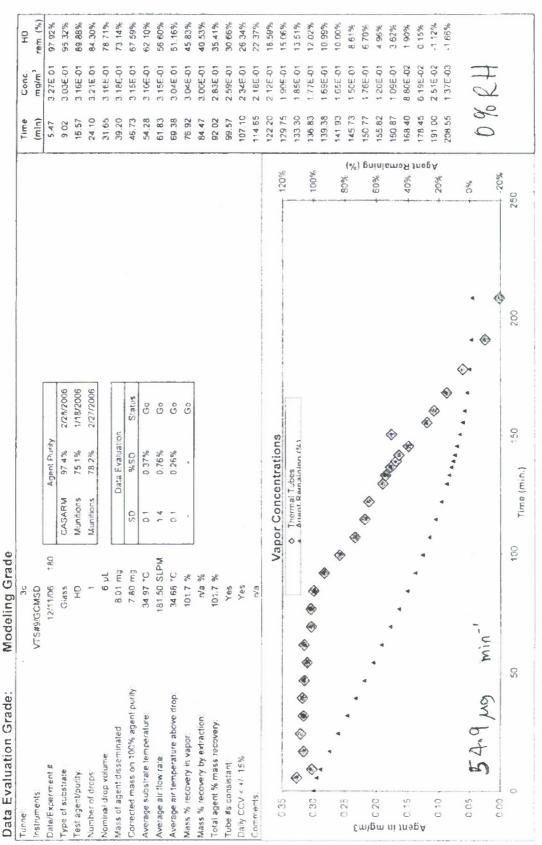


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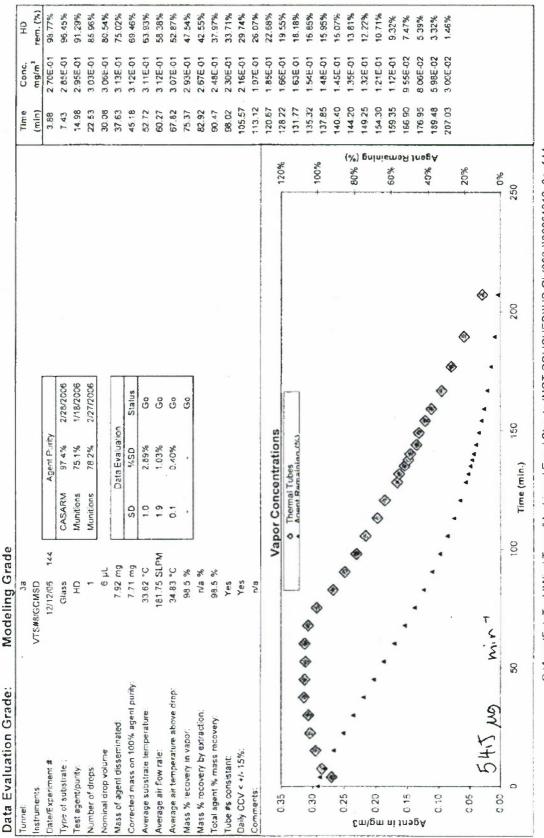
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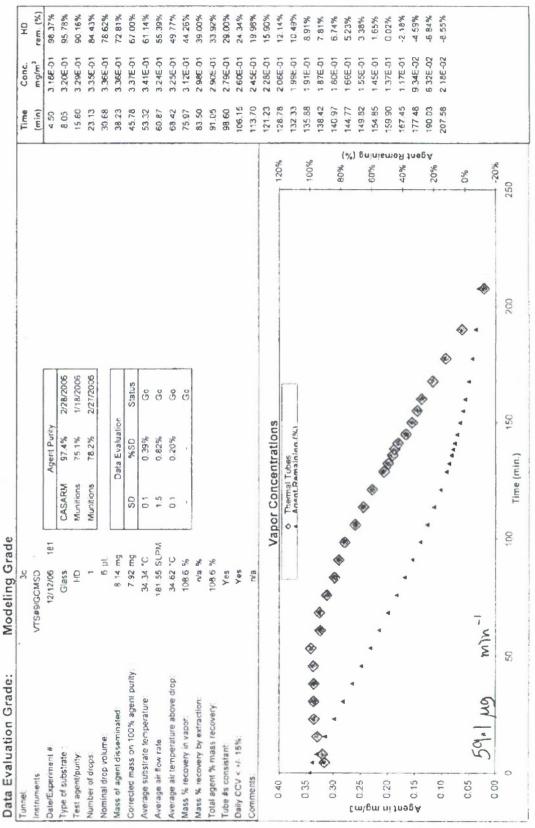
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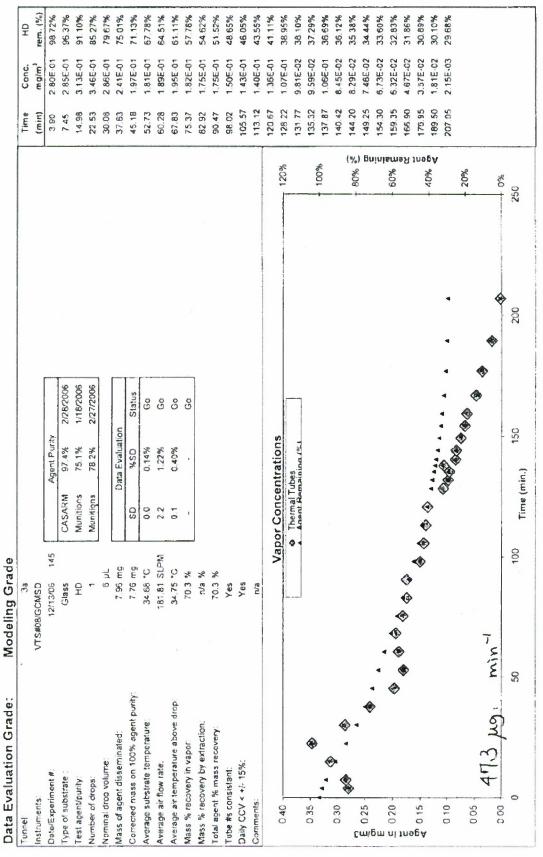
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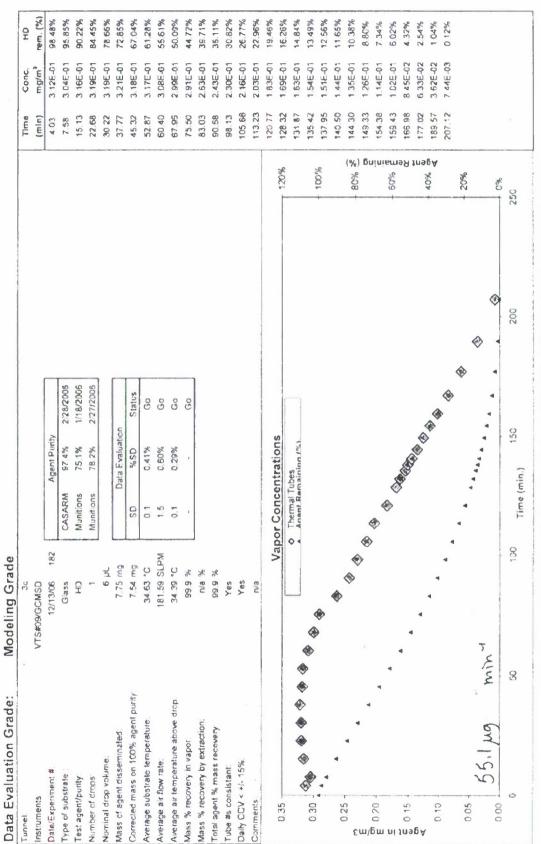
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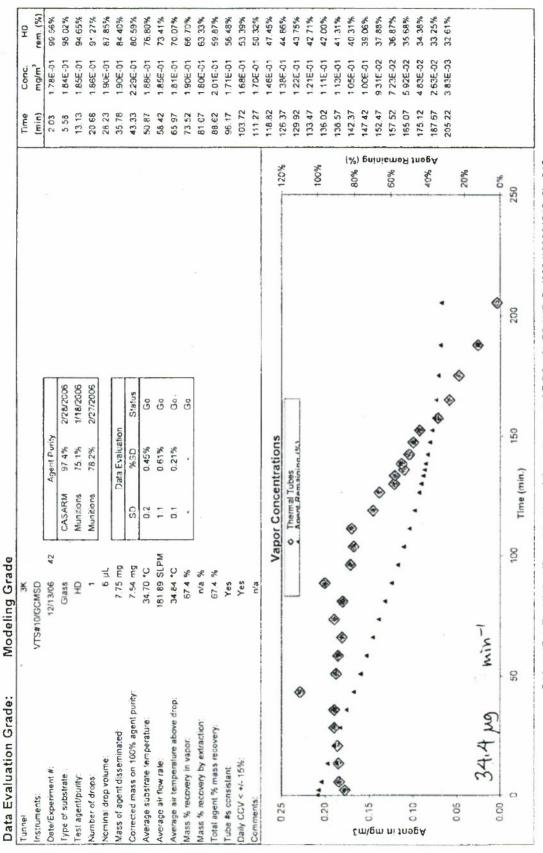
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G: AgentFateTechlWind TunnelMrchieved Excel Sheets (NOT POLISHED): MD GL(000-):20061213\_3a\_145

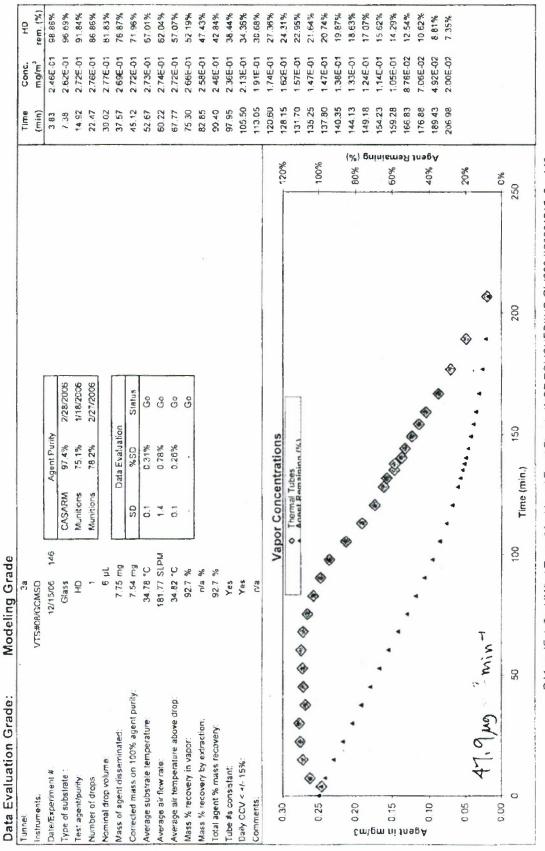


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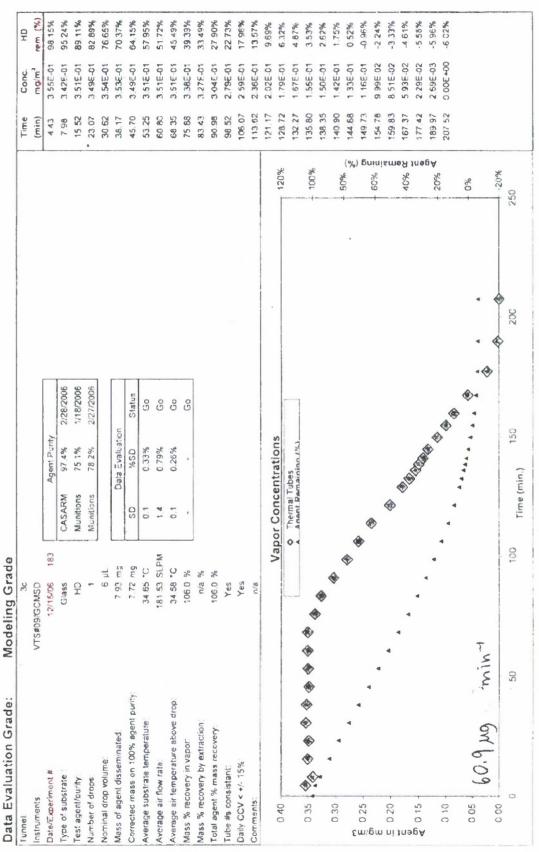


	0000								
Tunnell	ic .						Time	Conc.	HO
Instruments	VTS#11/GCMSD						(min)	mg/m³	rem. (%)
Date/Experiment #:	12/13/06 40		Agent Purity				2.03	1.84E-01	99.55%
Type of substrate:	Glass	CASARM	97.4%	2/28/2006			5.57	1,736-01	96.03%
Test agent/purity	9	Munitions	75.1%	1/18/2006			13.12	1.77E-01	94.85%
Number of drops:	ş=	Munitions	78.2%	2/27/2006			20,67	1.74E-01	91.68%
Nominal drop volume	6 µL						28.22	1,766-01	86.48%
Mass of agent disseminated:	2.75 mg	ä	Data Evaluation	-			35,77	1.836-01	85.21%
Corrected mass on 100% agent purity:	7.54 mg	SD	05%	Status			43.32	1.86E-01	81.85%
Average substrate temperature:	35.17 °C	0.1	0.42%	ဗိ			50.87	1.93E-01	78.42%
Average air flow rate:	181.71 SLPM	1.1	0.59%	°S			58.42	1.90E-01	74 94%
Average air temperature above drop.	35.02 °C	0.1	0.23%	ŝ			65.97	1,89€-01	71.50%
Mass % recovery in vapor.	640 %	4	y	Go			73.52	1.84E-01	68.11%
Mass % recovery by extraction:	% E/U						81.07	1.77E-01	64 83%
Total agent % mass recovery.	640 %						88.62	1.65E-01	61.72%
Tube #s consistant	Yes						24.36	1.61E-01	58.75%
Daily CCV < +/- 15%	Yes						103.72	1.46E-01	\$5 97%
Comments	n/a	A.c. in IIIIii dr viid-dista et ette d dessempenden apage	######################################		h	An authority with	111.27	1.34E-01	53.42%
	200	anditestangual voncy	fratione				118.82	1.225-01	51.09%
0 25		ייין בסווכם	III allons		And the second s	120%	126.37	1.18E-01	48 91%
		A Anant Ramaining (%)	sining (%)				129.92	1.17E-01	47.90%
4						* 0000	133.47	1.03E-01	46.96%
0.20	•					23-	136.02	1.02E-01	46.33%
							138.57	1.06E-01	45.69%
*						(%)	142.37	9.46E-02	44.78%
ςς ω/I	•					6u	147.42	9 356-02	43.63%
) 5 au						ini	152.47	8.47E-02	42.55%
ui l	4	4	6		*	# 609 # mi	157.52	8 65E-02	41.51%
contract	•	3	63.69			1 B	165.07	6.51E-02	40.13%
6 <b>v</b>		•	( OO	9			175.12	5.26E-02	38.71%
			,,	•	4	6 <b>v</b>	187.67	3.93E-02	37.32%
200				<b>♦</b>		Na-street et e	205.22	2.10E-02	36.04%
20.0				A	•	+ 20%			
32.6 mg	min-1				•	ı			
0 0 5	50 100		150		200 25	250			
		THE CHIEF	11.1						

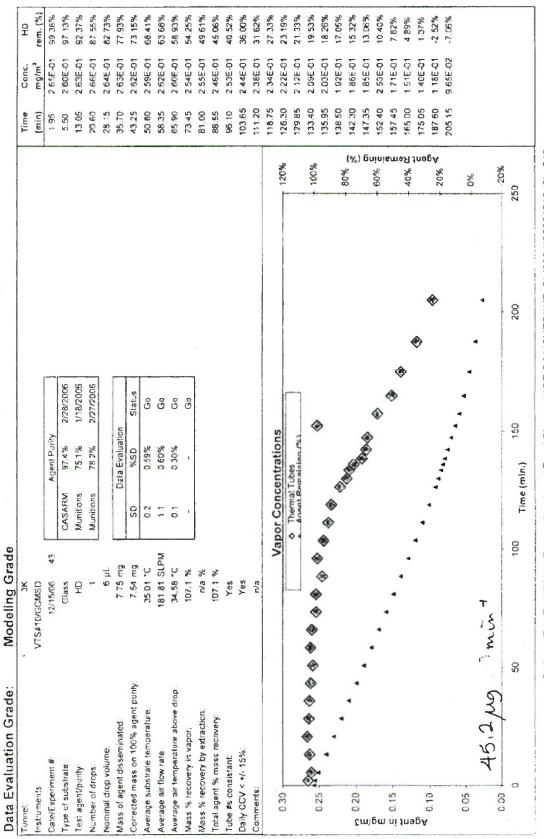
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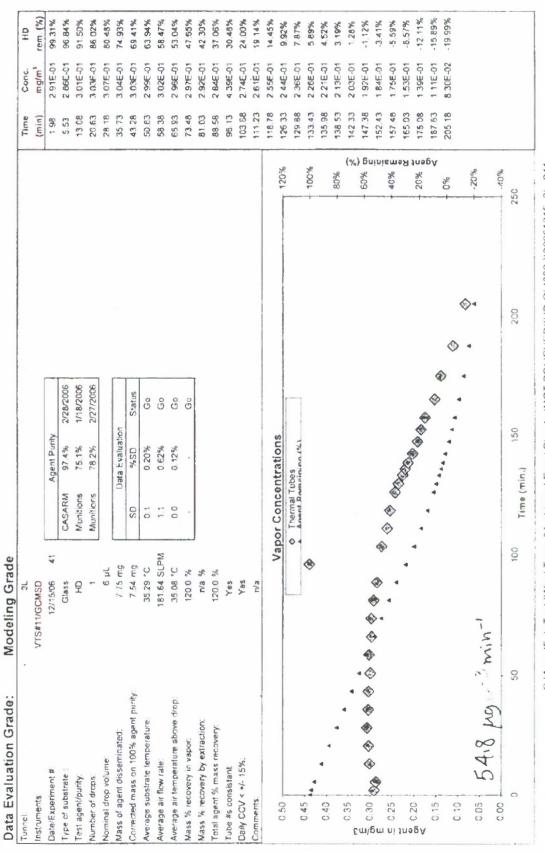
G:\Agen|FateTech\Wind Tunne|\Archieved Excel Sheets (NOT POLISHED)\HD GL(000-)\20051215\_3a\_146



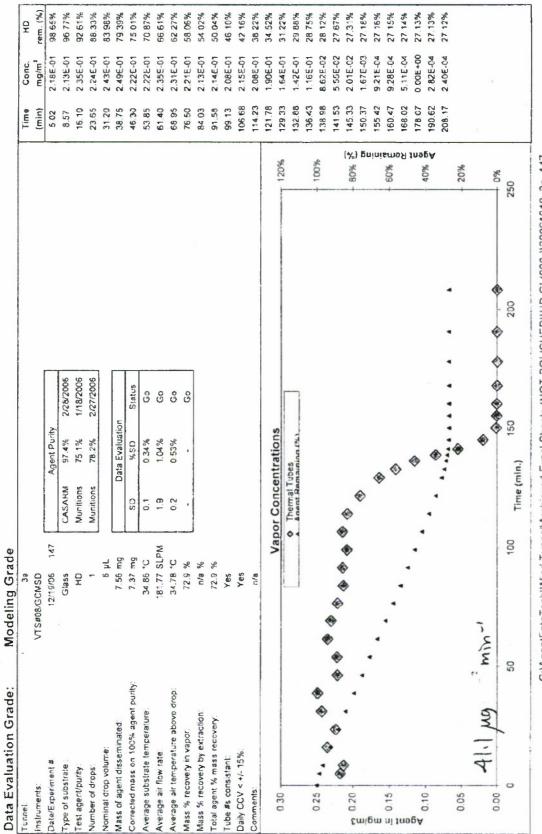
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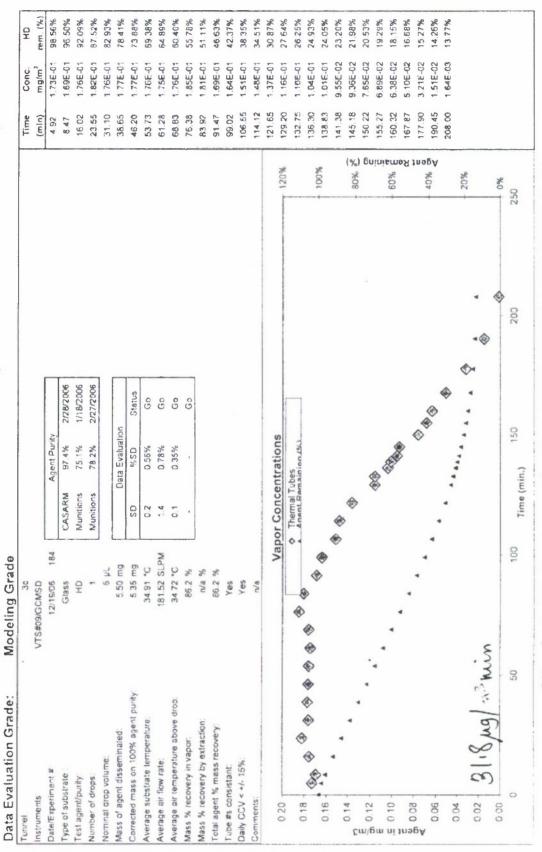
G: Agent Fate Tech Wind Tunnel Varchieved Excel Sheets (NOT POLISHED) NHD GL(000-) \20061215\_3k\_043



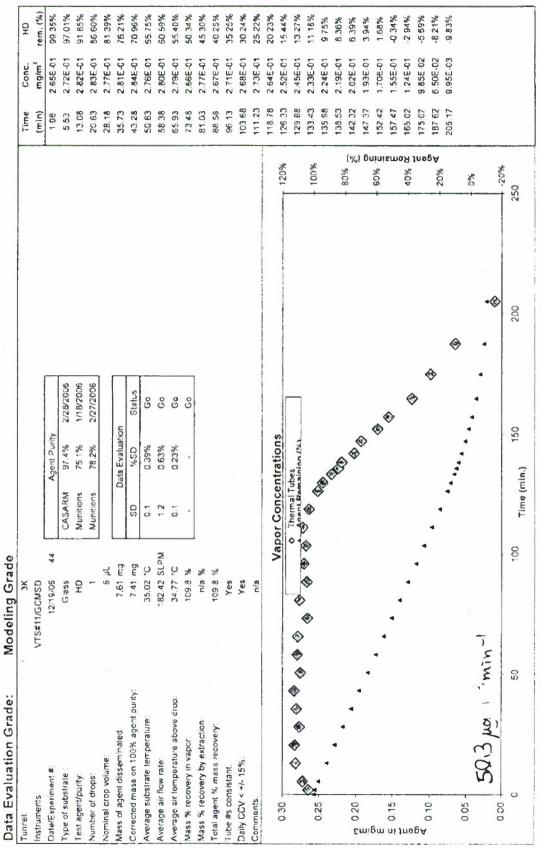
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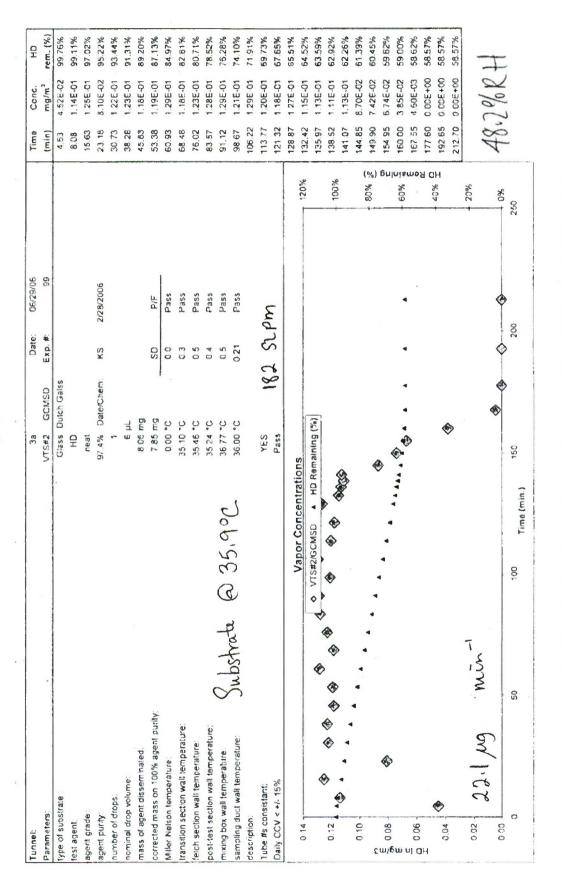


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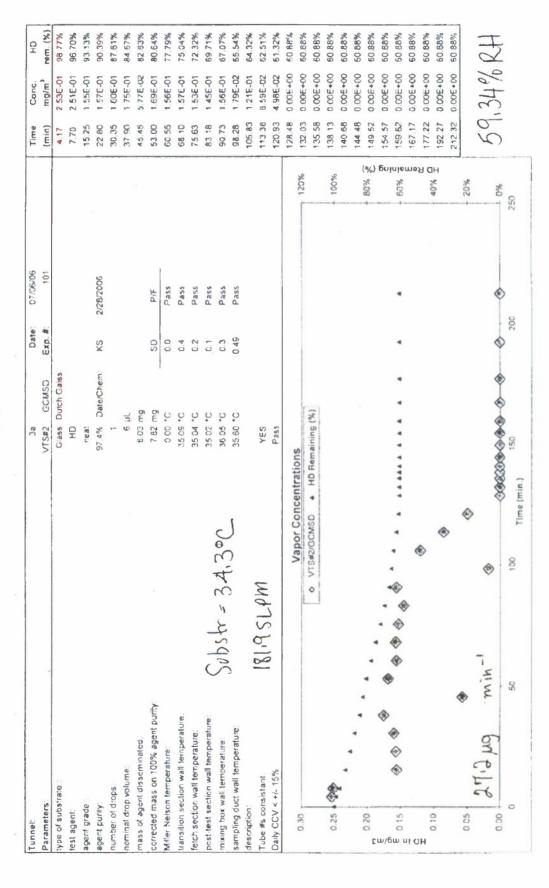


Data Evaluation Grade:

0000							Time	Conc	
									2
Instruments	VISHIOGOMSO						(min)	e de la	rem. (%)
Date/Experiment #	12/19/06 42		Agent Punty				1.97	2.38E-01	99 43%
Type of substrate:	Giass	CASARM	97.4%	2:28:2006			5.52	2.235-01	97.41%
Test agent/punity:	QH	Munitions	75.1%	1/18/2006			13.07	2.43E-01	93 09%
Number of drops:	w.	Musitions	78.2%	2/27/2006			20.62	2.42E-01	88.59%
Nominal drop volume	Tr 9						28.17	2.46E-01	84.07%
Mass of agent disseminated:	7.61 mg		Data Evaluation	c			35.72	2 34E-01	79.62%
Corrected mass on 100% agent punity.	7.41 719	as	48D	Status			43.27	2.465-01	75.16%
Average substrate temperature	35,14 °C	0.1	0.34%	Go			50.82	2.356-01	70.69%
Average air flow rate	182.30 SLPM	12	0.64%	Go			58.37	2 39E-01	66.28%
Average air temperature above drop.	34.58 °C	0.1	0.34%	ç			65.92	2.42E-01	61.81%
Mass % recovery in vapor	101.1%	)		°S			73.47	2.446-01	57.31%
Mass % recovery by extraction	% EN						81.02	2,366-01	52.85%
Total agent % mass recovery	101 1 %						88.57	2.346-01	48.49%
Tube #s consistant:	Yes						96.12	2.38E-01	44.10%
Daily CCV < +/- 15%;	Yes						103.67	2.335-01	39.73%
Comments:	n/a						111.22	2.336-01	35.40%
	- N		4.00				118.77	2.25E-01	31,14%
030	Va	0	ntrations			120%	126.32	2.17E-01	27.03%
. 1	Commission of the Commission o	A Anant Pen	Inemail Jubes Agent Bemaining (%)				129.87	2.12E-01	25.16%
						+ 100%	133.42	2.02E-01	23.35%
(a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c		•					135.97	1 985-01	22.10%
	>					300	138.52	1.986-01	20.86%
3 520 -						(%)	142.32	1 94E-01	19.02%
			(A)	6			147.37	1,855-01	15 67%
ົວເພ	4			<b>(4)</b>		+ 60% in	152.42	1.80E-01	14.40%
E 0.15	4			<b>\( \)</b>		em	157.47	1,58E-01	12.24%
lue	•			•		40% Pe	165.02	1.48E-01	830%
		4			<	uə	175.07	1,30E-01	5.85%
0.10		4	****		*	20% A	187.62	1.01E-01	2 28%
dis amount			4	4		2	205.17	5.79E-02	.1 15%
0.05				•	◈	ð			
43.5 Mgm + min-	min-1				•	ę D			
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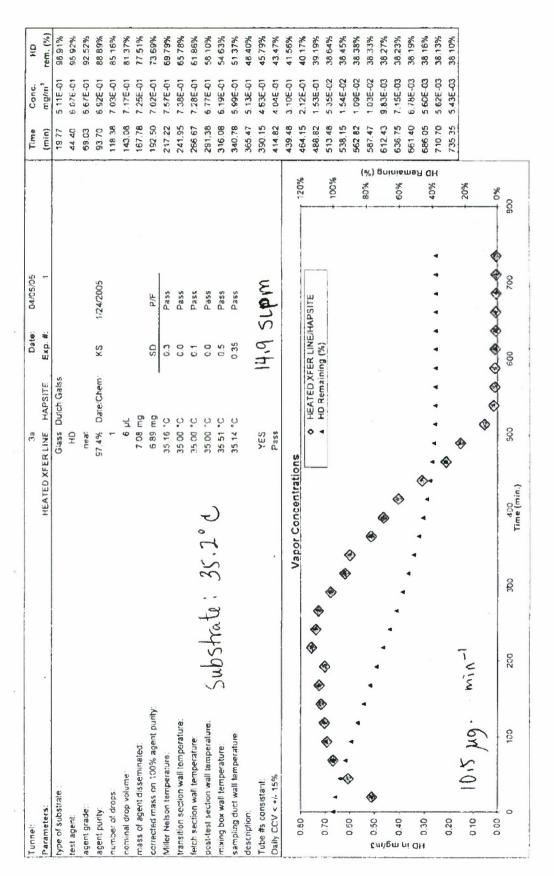


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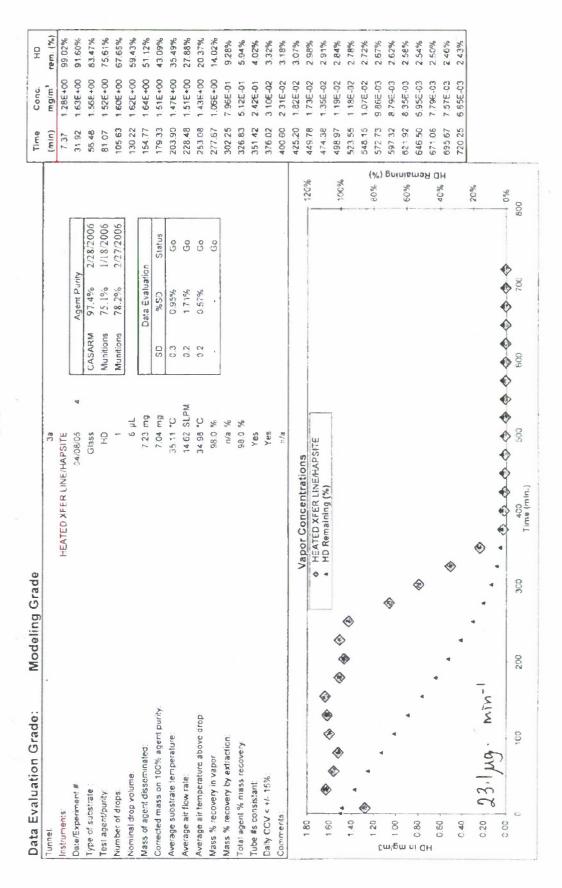
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					-			•	
		32					(min)	mgim	rem. (%)
Instruments	HEATED XFER LINEMAPSITE	PSITE					8.12	7.40E-01	95.37%
Oate/Experiment #	Ŏ	04/06/05 2		Agent Purity		nith resign	32.75	8.335-01	95.34%
Type of substrate.		Glass	CASARM	97.4%	2/28/2006		57.42	8,78E-01	90.94%
Test agent/purity		유	Mundions	75.1%	1/18/2006		82.12	8.29E-01	86.54%
Number of drops:		-	Munitions	78.24.0	2/27/2006		106.83	8.78E-01	82,15%
Nominal drop volume:		5 µL					131.57	8.968-01	77.58%
Mass of agent disseminated:		7.17 mg	3	Data Evaluation	DO		156.33	8.87E-01	72.98%
Corrected mass on 100% agent purity:		6.98 mg	SD	94.SD	Statius		181.13	9 74E-01	68.17%
Average substrate temperature:		36.05 °C	0.0	1.02%	Go		205.97	9.83E-01	63.10%
Average air flow rate:		14.55 SLPM	9.0	8:27	Go		230.82	1.04E+00	57 86%
Average air temperature above drop;		35.21 °C	0 7	%56:	G <sub>0</sub>		255.68	1.035+00	52.50%
Mass % recovery in vapor:		75.3 %	1	1	Go		280.65	9.22E-01	47 43%
Mass % recovery by extraction:		Na %					305.50	9.65E-01	42.54%
Total agent % mass recovery:		75,3 %					330.45	9.39E-01	37.59%
Tube #s consistant:		Yes					355.40	9.65€-01	32.64%
Daily CCV < +/- 15%:		Yes					380.37	7.87E-01	28.08%
Comments:	***	n/a					405.35	5.06E-01	24.72%
	en (iteration of a cont.)						00.00	0.00E+00	0.00%
	TO SEED - WIT BLADOLT		man man transcent characteristic decides about	Warte all the state Augustal principals		120%	00'0	0.00€+00	0.00%
€ C T	HEALED AFER LINEMAPOLIO						000	0.00E+00	96000
į		•	<			100%	0.00	0.00E+00	0.00%
4		♠	\$\rightarrow \text{\ti}\text{\texi{\text{\texi{\text{\texi}\text{\texi}\text{\text{\text{\tex{\texit{\text{\texi}\text{\text{\texi}\text{\text{\texit{\text{\texi}\texi{\texi{\texi}\text{\texi{\texi{\texi{\texi{\texi{\texi}				00'0	0.00€+00.0	2,00%
<ul><li>♦</li><li>♦</li><li>♦</li><li>♦</li><li>♦</li><li>♦</li><li>♦</li><li>♦</li><li>♦</li></ul>	•	>					00.00	0.00E+00	%000
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01W 00W1	4					Bul	0.00	0.00E+00	0.00%
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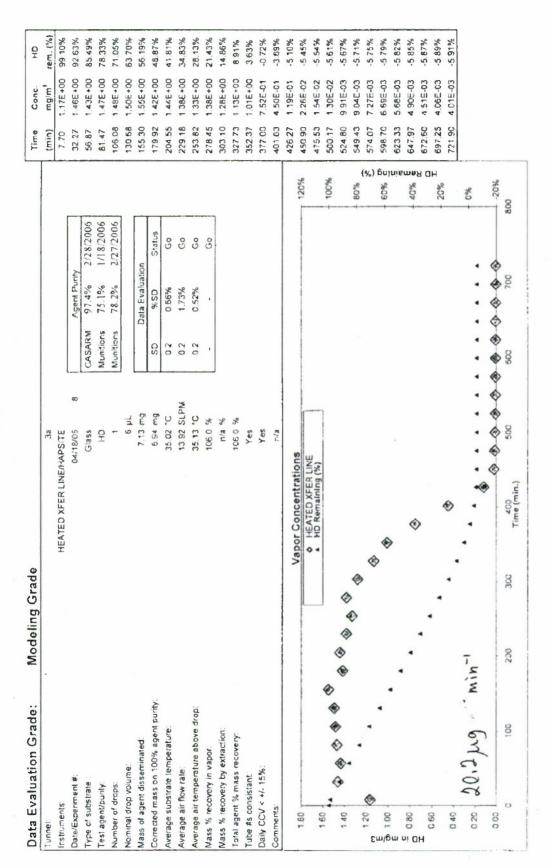
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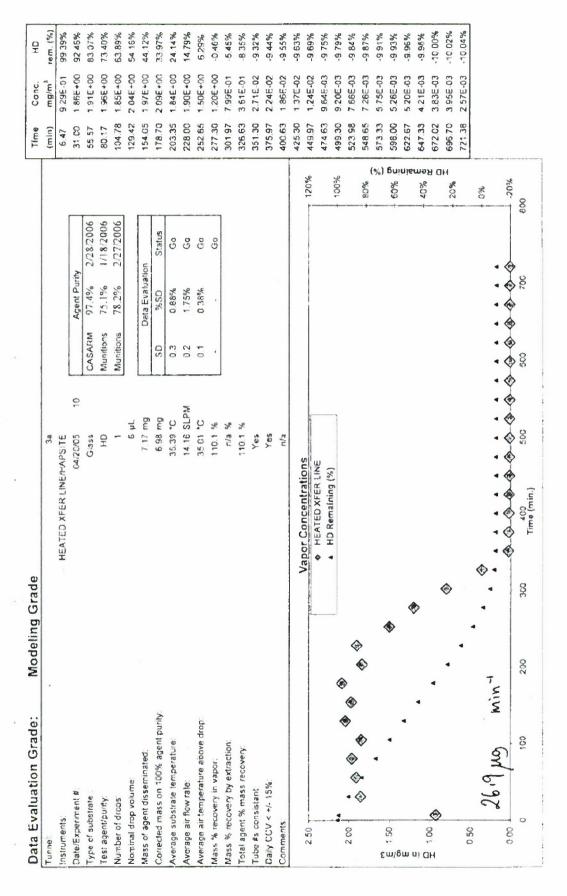
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G VagentFateTech\Wind Tunnel\Archieved Excel Sheets (NOT POLISHED)\HD GL(00--)\20050418\_3a\_08

Instruments Date/Experiment # Type of substrate	HEATED XFER LINE/HAPSITE					(a) E	mq/m	rem. (%)
Date/Experiment #: Type of substrate Test appendix mily						6.65	1 CEE +00	99 29%
Type of substrate. Test anant/munity	04/19/05 9		Agent Purity	<b>&gt;</b>		31.23	1.34E+00	93,33%
	Glass	CASARM	97.4%	2/28/2006		55.83	1,416+00	86.51%
3	유	Munitions	75.1%	1/18/2006		80.45	1,41£+00	79.51%
Number of drops	-	Munitions	78.2%	2/27/2006		105.08	1.33E+00	72,70%
Nominal drop volume:	3					129.72	1.43£+00	65.85%
Mass of agent disseminated:	7.13 mg		Data Evaluation	ou		154.35	1.46E+00	58.69%
Corrected mass on 100% agent burity	6.94 mg	SD	W.SD	Status		178 98	1 45E+00	51,48%
Average substrate temperature:	35.23 °C	0.2	0.51%	99		203.60	1.44E+00	44.32%
Average air flow rate:	14.00 SLPM	0.2	1.53%	O <sub>O</sub>		228.23	1.32£+00	37 47%
Average air temperature above drop:	35.15 °C	0.1	0.34%	°C		252.88	1.418+00	30.68%
Mass % recovery in vapor.	106 6 %	٠	4	60		277.53	1,315+00	23.91%
Mass % recovery by extraction:	Wa %					302.18	1.225+00	1761%
Total agent % mass recovery:	106.6 %					326.83	1,14E+00	11,73%
Tube #s consistant:	Y 48					351.48	1.06E+00	6.25%
Daily CCV < +/- 15%;	Sex					376.13	8.77E-01	1,43%
Comments	n/a					400 78	7 006-01	2.49%
						425.43	3.00E-01	4.97%
1.60	A HEATED YEED ING				120%	450.08	2.76E-02	.5.79%
						474.73	1.89€-02	-5.90%
					100%	499.38	1.46E-02	.5.99%
						524 03	1.21E-02	-6.05%
•					4,09	548.63	1.07E-02	-6.11%
\$ 50	•				(%)	573 33	8.63E-03	6.16%
	(				50g	598 00	7.42E-03	-6.20%
08:0	>>				uje	622.65	6.46E-03	-623%
11 G	<b>③</b>				40% m93	647.30	6.01E-03	-6.26%
- 090					H 0	671.95	5.23E-03	6.29%
•					H %02	656 50	3 80E-03	-6.31%
0.40	*					721.25	4.05E-03	6.33%
1917 Mg min	•	4	•	•	ž č			
200	0000	X 0 0 0	0	4	20%			
0 100 200 300	200	900	700		800			

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	3a				(mim)	mg/m³	rem. (%)
Instruments:	HEATED XFER LINE/HAPSITE				2.50	04E+00	99 74%
Date/Experiment #	04/21/05 11	Agent Puny			27.03	35E+00	93 82%
Type of substrate	Glass	CASARM 97.4% 2.28	2,728,72005		51.62	.33E+00	87.16%
Test agent/purity.	0	Munitions 75.1% 1/18	1/18/2006		76 20	385+00	80.43%
Number of drops:		Munitions 78.2% 2/27	2/27/2006	4	100.80	32E+00	73.72%
Nominal drop volume	6 pL				125.40	38E+00	67.01%
Mass of agent disserrinated:	7,16 mg	Data Evaluation		-	150.00	39E+00	60.12%
Corrected mass on 100% agent purity.	6.98 mg	is cs% as	Status	-	174.62	23E+00	53.58%
Average substrate temperature:	35 17 °C	0.2 0.54%	Go	-	199.23	33E+00	47.20%
Average as flow rate:	14.12 SLPM	0,4 2,99%	ŝ	2	223.85	37E+00	40 48%
Average air temperature above drop:	35.11 °C	0.3 0.72%	09	2	248.47	29E+00	33.88%
Mass % recovery in vapor	103.9 %	×	00	2	273.06	1.25E+00	27.57%
Mass % recovery by extraction:	% 8/0			~	297.70	1.28£+00	21.27%
Total agent % mass recovery	103.9 %			(E)	322.33	1.31E+00	14.82%
Tube #s consistant	Yes			n	346.97	1,03£+00	8.99%
Daily CCV < +/- 15%;	Yes			e)	367.62	8.30E-01	5.11%
Commerts.	¢/u			e	396.27	5.76E-01	1.03%
	A STATE OF THE PROPERTY OF THE				420.92	3.40E-01	-1.25%
1 600 percentage control of the cont	A HEATED YEED ING	And the second s	120%		448.55	1.77E-01	-2.70%
•	◆ HD Remaining (%)			4	470.20	2 47E-02	.3.14%
	<b>*</b>		*D01		494.83	1,71E-02	-3.24%
				MO.	519.47	1.46E-02	-3 32%
4			80%	(	544.12	1.15E-02	3 39%
•	٠			(%)	558.75	9.02E-03	3.44%
.u/5			%09 +	Бu)	593.38	8.51E-03	.3 48%
0.80	�				618 02	7.56E-03	-3.52%
ni Q			%07 -	เมอ	642.65	6.74E-03	-3 56%
▼ 050 H	•				667 27	6.00E-03	3 59%
•	<b>*</b>		20%	н	691.90	5.01E-03	-3 62%
0.40	•		-		715 53	5.04E-03	-364%
020 18 16 Mg Min-1	* * * * * * * * * * * * * * * * * * * *	4 4 4	%0				
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1.36€+00 1,756+00 1.68E+00 1.54E+00 1,57E+00 1.69E+00 1.92E+00 1.86E+00 1.77E+00 1.65€+00 1.61E+00 1.39E+00 9 476-01 3.14E-01 3.03E-02 2.05E-02 1.53E-02 1.32E-02 1.07E-02 8 32E-03 7.35E-03 6.09E-03 5.93E-03 4.83E-03 4.58E-03 3.76E-03 3.66E-03 3.42E-03 5.235-01 mg/m 133.27 207.40 280.88 305.48 403.92 428.52 551.52 108.68 157.87 182.47 231.67 330.10 354.72 379.32 477.72 502.32 528.92 576.12 600.72 625.32 649.92 699.00 723.60 59.50 256.27 453.12 674.40 84.08 (mim) (%) gninismaH OH **%001** 120% .20% 80% %09 40% 20% 80 88 1738/2006 2/28/2006 2/27/2006 Status CO Go Go Data Evaluation Agent Purity 97.43% 75.1% 073% 78.2% %SD 5.21% 0.58% CASARM Munitions Munitions 0.3 00 0.7 0.2 13.98 SLPM J. 60'9E 7.08 mg 5.90 mg 5 vt 106.7 % 34 68 °C Na % 106.7 % Yes Kes 39 05/02/05 Glass HEATED XFER LINE/HAPSITE Vapor Concentrations
HEATED XFER LINE/HAPSITE
HD Remaining (%) 400 Time (min.) 000 0 4 Modeling Grade 8 2 4.8 Mg ... " Min-1 200 Corrected mass on 100% agent purity: Data Evaluation Grade: Average air temperature above drop; 100 Average substrate temperature Mass % recovery by extraction. Total agent % mass recovery. 3 Nass of agent disseminated Mass % recovery in vapor: Nominal drop volume. Average air flow rate. Daily CCV < +/- 15% Tube #s consistant Date/Experiment # Type of substrate Number of draps. Test agent/purity Instruments 0 Comments: 2.00 1.55 000

38.12% 29.48%

73.98% 65.57% **%69.99**  13.83%

21.66%

6.37%

%95 O

-311% -5.19% -6.18% 627% 5.34%

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-6.40%

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-6.55% -6 57% -6.60% -6 62% % P9 9-

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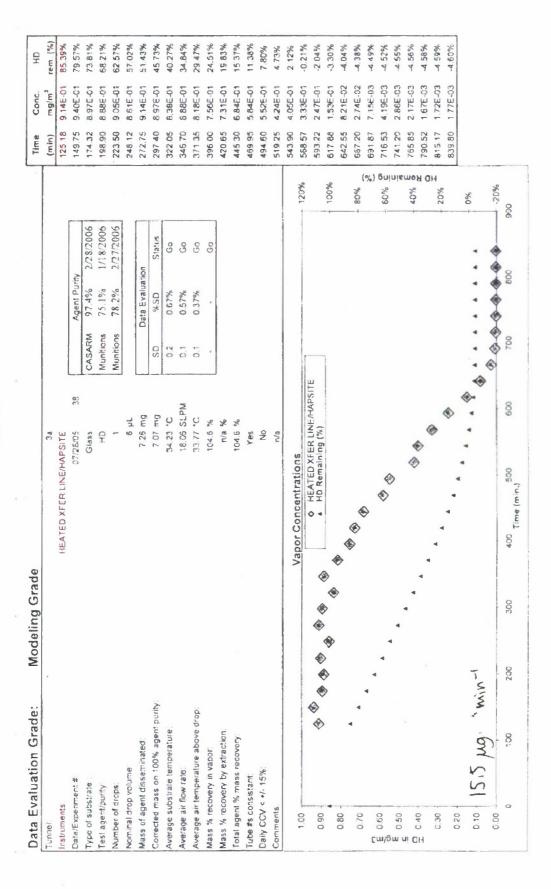
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Data Evaluation Grade: M	Modeling Grade			Time	Conc.	CH
Tunnel	β			(min)	ma/m	(%) Ear
Instruments:	HEATED XFER LINE/HAPSITE			3.27	7,25E-01	99.69%
Date/Experiment #	07/27/05 37	Agent Purity	F	27.88	0.00E+00	97.37%
Type of substrate	Glass	4 97.4% 2/28/2006	g wide to	52.50	8 98E-01	94 49%
Test agent/purity:	HD Munitions	s 75.1% 1/18/2006	agenteuran	77.15	9.158-01	88.67%
Number of drops:	Munitions	s 78.2% 2:27:2006		101.82	8.81E-01	82.89%
Nominal drop volume.	1d 0			126.50	8.81E-01	77.23%
Mass of agent disseminated.	7 12 mg	Data Evaluation		151,20	9.56E-01	71.29%
Corrected mass on 100% agent purity.	OS 693 mg	%SD Status		175.92	9.24E-01	65 20%
Average substrate temperature:	34.67 °C 02	0.60% Go		200.63	9.41E-01	59.20%
Average air flow rate:	18.06 SLPM 0.2	0.87% Go		225 35	8.81E-01	53.34%
Avarage air temperature above drop.	33.85 °C 0.2	049% Go		250 05	8.81E-01	47.67%
Mass % recovery in vapor:	% 1.0.1 %	- Go		274.73	8.24€-01	42 19%
Mass % recovery by extraction.	% =/~			299.38	7,756-01	37.06%
Total agent % mass recovery:	110.1 %			324.03	7.61E-01	32.12%
Tube #5 consistant	Yes			348 68	6.905-01	27.47%
Daily CCV < +/- 15%:	Yes			373.32	6.83E-01	23.06%
Comments	e/u			397.95	6 28E-01	18.86%
	Variation of San and Variation			422.58	6.04E-01	14.90%
20			126%	447.22	5.57E-01	11.18%
and a different	◆ HO Remaining (%)		0	471.85	4.54E-01	7 94%
4 100	The Assessment of the Contraction of the Contractio		100%	496.47	4.61E-01	5 00%
• <			vidude, "An	521,16	3.96E-01	2 25%
♦	<b>♦</b>		80%	545 72	3,55E-01	-0.15%
2.80	<b>◆</b>		%)	570 35	3.198-01	.231%
<b>\$</b> —и/6			6u	594 98	2,706-01	4 20%
000			nis	619.62	2.36E-01	-5.83%
			40% men	544.25	2.21E-01	-7.29%
H			8 0	668.87	1.66E-01	-8 53%
. 77			₹ 50%	05 869	1.20E-01	-8.45%
		<	-	718.12	6.97E-02	-10 06%
15.8 Mg - min	4 4 4 4	♦	%0			
0000		•	20%			
100	20C 360 400 500 600	200	800			
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Data Evaluation Grade:	rade:	Modeling Grade							Time	Conc.	9
Tunnel	*		36	u					(min)	mg/m³	rem. (%).
Instruments			HEATED XFER LINE/HAPSITE	117					12.85	4 69E-01	99.22%
Date/Expenment #			201121105	N 10		Agent Purity			37.70	5 29E-01	%00'96
Type of substrate:			Glass	ch ch	CASARM	97.4%	2/28/2006		62.58	5 185-01	92.61%
Test agent/purity:			9	0	Mundions	75.19%	1/18/2006		87.50	5.06E-01	89.30%
Number of drops:				qu'es.	Munitions	78.7%	2/27/2006		112.43	4.57E-01	86.17%
Nominal drop volume.				6 µL					139.63	4.36E-01	83.02%
Mass of agent disseminated:			7.10	7,13 mg		Data Evaluation	00		164.50	4,73E-01	80.07%
Corrected mass on 100% agent purity.	ent purity:		ð. 9	6 94 тд	SD	GS%	Status		189.57	4.74E-01	77.03%
Average substrate temperature	Lre.		35.81 °C	0,1	0.3	0.63%	cco		214.53	4.48E-01	74.00%
Average air flow rate:			18.0	18.05 SLPM	0.0	0.22%	Go		239.50	4.67E-01	71.03%
Average air temperature above drop'	we drop:		3, 69,76	J. 6	0.3	%620	Go		264.45	4.77E-01	87.97%
Mass % recovery in vapor.			57.6	57.6 %	•		Go		289.37	4 SCE-01	84.97%
Mass % recovery by extraction:	on:		TV2	% E/U					314.27	3.99E-01	62.22%
Total agent % mass recovery			57.6	57.6 %					339,15	4.00E-01	59 64%
Tube #s consistant:			Yes	UN.					364.03	3 635-01	57.17%
Daily CCV < +1, 15%			O.Z.	0					388.92	3416-01	54 89%
Comments:		,	nis	60					413.78	3.44E-01	52 68%
									438.67	2.96E-01	50.61%
0.60	A WAY TO THE MANAGEMENT AND THE PARTY OF THE		HEATEN YEED INEMADERE	Auman, em aujorenavan-annamari, aprincipa de partir de la companya			Albert Albert Gereiteren der einem Leesteren der Albert Al	120%	463.55	2.89E-01	48.72%
•		•	HO Remaining (%)	o paramento y					488.43	2.31E-01	47.03%
0.50	•			1				100%	513.32	2.146-01	45.59%
•	•		4						538.18	1.695-01	44.36%
4	<b>(</b> )•	•	•						563 05	1286-01	43.40%
£.		4	<b>⋄</b>					%) %0%	587.92	7.78E-02	42.73%
w/δ		•	*					Bu	612.78	2.21E-02	42.41%
F 0.30			•	@				+ 50% in	00.0	0.00E+00	%00'0
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Tunnel. Instruments Protoff comment at				-				-
Singulation of the comment of the co	၁၃					(min)	mg/m³	rem. (%)
The state of the s	HEATED XFER LINEHAPSITE					3.00	8.355-01	99,67%
Carlo II a factor and a factor	08/03/05		Agent Purity			27.57	1.35E+00	92 68%
Type of substrate	Gass	CASARM	97.49%	2/28/2006		52.17	1.415+00	83 83%
Test agentiounity:	HO	Munitions	75.1%	1/18/2006		78.53	1,48E+00	73.90%
Number of drops:	•	Munitions	78.2%	2/27/2006		103.17	1.50E+00	84.33%
Nominal drop volume	77.9					127.82	1.44E+00	54.88%
Mass of agent disseminated.	7.11 mg		Data Evaluation	C		152.48	1.54E+00	45.32%
Corrected mass on 100% agent purity:	6 53 mg	SD	QS%	Status		177.13	1.36E+00	36.02%
Average substrate temperature:	34 99 °C	0 3	8.2.0	Ga		201.80	1.56E+00	26,65%
Average air flow rate.	18 05 SLPM	0.2	0.89%	00		226.45	1.46E+00	16.96%
Average all temperature above drop:	34,49 °C	0.3	081%	°S		251,12	1.41E+00	7,73%
Mass % recovery in vapor.	128 1 %	1	*	Ga		275.77	1,516+00	-1 65%
Mass % recovery by extraction	% 571	A				300.42	1.30E+00	-10.69%
Total agent % mass recovery.	128 1 %					325.05	8.896-01	-17,72%
Tube #s consistant:	Yes					349.68	6.89E-01	-22.78%
Daly CCV < +/- 15%	ON					374.33	3.38E-01	-26.08%
Comments	η/a					358.97	1.08E-01	-27.51%
	V = 0 = 0 = 0 = 0 = 0					423.60	1.19E-02	-27.90%
200 - The second of the second	3			A CONTRACTOR OF THE PERSON OF	120%	448.23	7.50E-03	-27.96%
C 44 +	◆ HEALED XFEX LINE/HAPSHE ► MD Remaining [%]	= =			a squarer sq	472.87	5,206.03	-28.00%
•	•				100% %	497.50	3.85E-03	-28 03%
♦	•				2006	522,13	2.97E-03	-28.05%
	•					546.78	2.336.03	-28.07%
£ 50					%) %09 +	571.42	1,10E-03	-28.08%
3 July 15						596.05	1.07E-03	-28,08%
	•				40% nie	620.68	0.00E+00	-28 09%
08.0					me;	00.00	0.00E-00	0.00%
	*				- 20% D	00'0	0.00F+00	0.00%
000	4					90.00	0 DOE +00	0.00%
0.40	•				%0	00.00	0.00E+00	%000
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Data Evaluation Grade: Mo	Modeling Grade				Time	Conc.	9
Tunnel.	328				(mim)	molm	rem. (%)
Instruments	HEATED XFER LINE/GCFPD				1.30	3.36E-01	99.94%
Date/Experiment #:	08/04/05 41		Agent Purity		5.88	5.40E-01	99 32%
Type of substrate:	Sies	CASARM	97,4% 2/28/2006	9/	12.47	2.09E+00	97,45%
Test agentipunity	Q.	Munitions	75.1% 1/18/2006	91	18.07	1.54€+00	94.85%
Number of draps.		Munitions	78.2% 2/27/2006	9	23.67	1,70E+00	92.54%
Nominal drop volume:	7/1 9				29 27	1.81€+00	%£0.06
Mass of agent disseminated.	7.22 mg		Data Evaluation		34 88	2.02E+00	87.28%
Corrected mass on 100% agent pority:	7.03 mg	SD	%SD Status		40.50	1.97E+00	84.42%
Average substrate temperature	33.85 °C	0.2	0.45% Ge		46.12	2.08E+00	81.52%
Average air flow rate:	17.96 SLPM	4.0	2.26% Go		51.73	1 84E+00	78.71%
Average air temperature above drop.	34 15 °C	0.3	0.85% Go		57.33	2.18E+00	75.83%
Mass % recovery in vapor.	77.6 %	ŀ	. Ge		62.95	1.96E+00	72.86%
Mass % recovery by extraction.	1/2 10/U				58.57	2.12E+00	69.94%
Total agent % mass recovery:	77.6 %				74.18	1,93E+00	67.04%
Tube #s consistant	, Yes				79.80	2.25E+00	64 04%
Daily CCV < +/- 15%:	No				35.42	2.13€+00	80.50%
Comments	N/3				91.03	2.39E+00	\$7.66%
					96 65	2.00E+00	54.50%
3.00	Vapor Concentrations	and the state of t	designation of the state of the	120%	102.27	2.33E+00	51,39%
	◆ HD Remaining (%)			t	107.88	2.12E+00	48.20%
2 60 44	A de la companya del companya de la companya del companya de la companya del la companya de la c			100%	114.08	2.30E+00	44 70%
4		•			119.70	2.23E+00	41.46%
•		<b>③</b>			125 32	2.39E+00	38.14%
3 200 -	· · ◆ · · ◆ · · ◆	•	4	(%) %C8 +	130.93	2,135+00	34.90%
⊕			<b>₽</b>	อิน	136.55	2.37E+00	31.68%
◆ • • • • • • • • • • • • • • • • • • •	4 4	•	٥	+ 60%	:42.17	1.37E+00	28.99%
	•	•		we	147.78	3.74E-01	27.74%
	**			9 0	153.42	4.70E-01	27.14%
87.		•			16193	1.62E+00	24 85%
		•	•		167.55	1.82E+00	22 39%
	7		•	20%			
,	A STATE OF THE STA			%0	vigulandenheni		
3 20 40	60 80 Time (min.)	140	183	. 80			
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	ė.						
Tunnel:	3.	Date:	07/11/06		Time	Conc.	9
Parameters:	VTS#3 GCMSD	Exp. #:	7		(min)	"m/bш	rem. (%)
type of substrate	Glass Dutch Galss				2.20	1.95E-01	93.95%
sest agent	OH.				5.75	1.936-01	59.78%
agent grade.	neat				13.30	2.02E-01	99 41%
agera purity	97.4% Date/Chemi	XS	2/28/2006		20.85	2.06E-01	99 02%
number of drops.	gen				28.40	2,16E-01	98.63%
nominal drop voteme	6 pt				35.95	2.07E-01	98.23%
mass of agent disseminated.	7.75 mg				43.50	2,11E-01	97.84%
corrected mass on 100% agent punty	7.54 mg	SD	PIF		51.05	2.11E-G1	97.45%
Miller Nelson temperature:	0.000	0.0	Pass		58.60	2.08E-01	%90 Z6
transition section wall temperature:	35.19 °C	6.4	Pass		66.15	2.096-01	96.67%
fetch section wall temperature:	3, 86'98	0.3	Pass		73.70	2.00E-01	96.28%
positest section wall temperature.	35 70 °C	0.5	Pass		81.25	2,035-01	95.91%
mixing box wall temperature;	35 64 °C	0.5	Pass		88.80	2.06E-01	95.52%
sampling duct wall temperature;	3, 98, 98	0.48	Pass		96.35	2.10E-01	95.13%
description					103.90	2.07E-01	SA.75%
Tube #s consistant:	YES	7	12 1 Pm		111.47	2.12E-01	94.35%
Daily CCV < +/- 15%	Pass				119.02	2,03E-01	93.96%
	Vanor Concontrations				125,55	1.94E-01	93 59%
	Vapol collect			102%	130,10	2.09E-01	93.42%
0	V D#S/GC/MS/C			_	133.65	2.15E-01	93 23%
				100%	136.20	1.936-01	93.10%
	•				138.75	Z.06E-01	92.98%
4					142.55	1.53E-01	92.81%
				%) % %	147.60	1.34E-01	32.63%
Ω				6u)	152.65	1.51E-01	92.45%
<b>√</b>	*			- 98 A	157,70	1.62E-01	92.25%
d C	•			məş	165.25	1,24E-01	91.99%
	4		•	9	175.30	1,23E-01	91.68%
		<b>⊗</b>			190 35	7.79E-02	91.30%
500	. 4 4 44				210.40	9.08E-02	90.88%
<	•			%26			
3.7 Mg. min		•	4				
>	The second secon			%06			
98	100 Time (min.)	200		250			
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		er COCCO COCCO Compression of the section of the se		20	5.338-401	94 98%
Date/Experiment #	09/14/05 68	Agent Purity		26.22	\$ 39E-01	82.72%
Type of substrate :	Giass CASARM	RM 97.4% 2/28/2006		40,62	5.35E-01	70.41%
Test agent/purity:	HD Munitions	ons 75.1% 1/18/2006		55 02	5.35E-01	58.14%
Number of drops:	Munitions	ons 78.2% 2/27/2006	bilionei- na	69.42	4 94E-01	46 34%
Nominal grop volume	100		1	83.82	4.99E-01	34 96%
Mass of agent disseminated.	11 58 mg	Data Evaluation		98.20	4.88E-01	23.66%
Corrected mass on 100% agent purity	11.36 mg SD	%SD Status		112.60	5.04E-01	12.30%
Average substrate temperature	34.90 °C 0.1	0,28% Go		127.00	4.89E-01	0.92%
Average air flow rate.	181.18 SLPM 1.6	C.88% Gp		141.40	4 698-01	.10.06%
Average air temperature above drop	34 58 °C 0.1	0.37% Ga		155.80	4.49E-01	-20.58%
Mass % recovery in vapor:	141.4 %	C. E. T.		170.20	3.43E-01	-29.66%
Mass % recovery by extraction:	% 8/10		1	184.60	0.00E+00	-33.59%
Total agent % mass recovery	141,4 %			199.00	0.00E+00	-33.59%
Tube #s consistant	Yes			213.40	0.00E+00	-33.59%
Daily CCV < +1. 15%	768			219.97	5.40E-01	.36.41%
Comments,	n/a			227.03	0.00E+00	.39.45%
	To so a Company of the control of th			234,10	0.00€+00	-39.45%
090	vapor concer		120%	241.17	0.00€+00	-39.45%
<	◇ VTS#1/GCMSO ▲ HD Remaining (%)		30,5	248 23	0.00E+00	-39 45%
© * * * * * * * * * * * * * * * * * * *	*		R 22	255.30	0.00E+00	39.45%
	<b>♦</b>		%08	262.37	0.00€+00	39 45%
				269.42	0.00€+00	-35.45%
040			(%) \$0	276.48	0.00 + 300.0	-39.45%
<b>4</b>			6u!	280.22	0 00E+00	39 45%
4 030				285.45	0.00€+00	-39 45%
ui ()			. 20% С	290.68	0.00€+00	-39 45%
H			§	298.42	0.00E+00	-39 45%
	4			308.65	1.21E-01	.40 44%
	4	•	-20%	318 BB	0.00E+00	-41 42%
92 A.S.	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	•	%07			
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-22.85% -30.91% -34.71% 36.79% 38 87% 40.89%

90.02%

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19.65%

11.14%

2.43% -6.24% -32.59%

42.82%

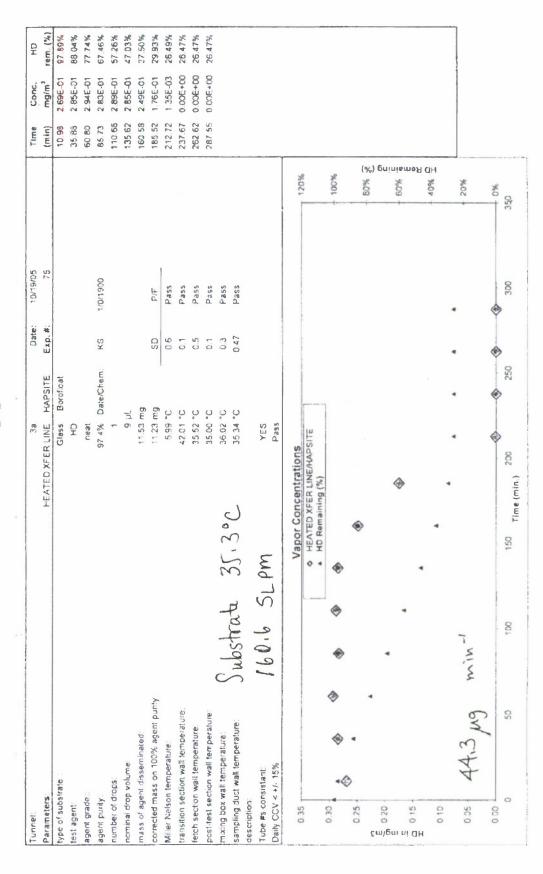
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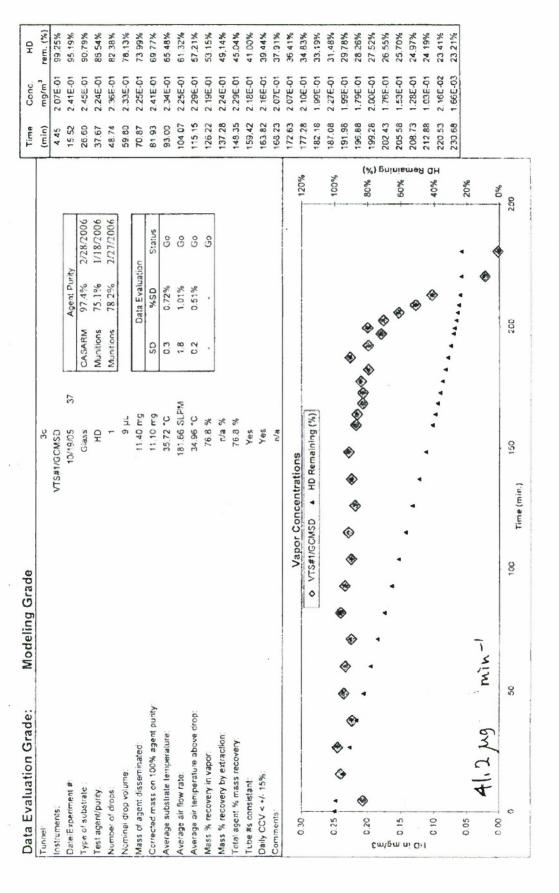
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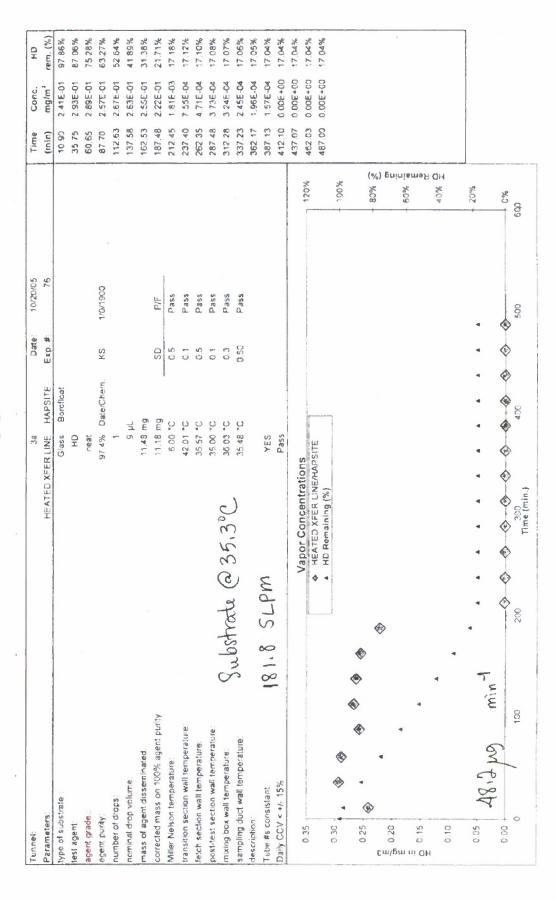
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rem. (%) 76.56% 41.11% 72.63% 58,60% 64.62% 57.01% 53.12% 34.53% 29.19% 28 88% 28.22% 28.09% 95.34% 91.71% 88.14% 84.38% 80 45% 49.34% 43.38% 38 90% 36.75% 29.58% 28 66% 99.13% 60.81% 45.59% 32.73% 31.16% 29.93% 28,45% 2.17E-01 8.35E-02 3.51E-02 1.16E-02 2,198-01 2.15E-01 2.14E-01 2.19E-01 2.25E-01 2.13E-01 2.08E-01 2.11E-01 1.99E-01 2.14E-01 2.15E-01 2.22E-01 1.86E-01 1.30E-01 8.99E-02 7.04E-02 4.97E-02 2.49E-02 4.12E-03 1.97E-01 96E-01 2.06E-01 1.948-01 1.52E-01 2.02E-01 2.15E-01 ma/m 126.68 178.85 192.23 215.10 224,55 104.55 137.77 148.83 159.90 172.53 185.42 199.07 221.40 246.50 115.62 166.22 212.70 218.25 228.70 236.35 205 88 16.00 27.08 49.22 60,28 82.42 93.48 Time (%) gninismoR OH 120% 100% 80% 809 40% 20% å 300 9002/81/1 2/27/2006 2/28/2006 Status 3 တိ රි රි Data Evaluation Agent Purity 75.1% 97.4% 78.2% 08% 0.82% 0.62% 0.57% 250 CASARM Munitions Munitions Ţ 03 0.2 S 38 200 181 69 SLPM 9 pL \$1.37 mg ♦ VTS#1/6CM/SD ▲ HD Remaining (%) **(** 11.07 mg 34.20 °C 35.00 °C 719 % 1/a % 71.9 % Glass 2 Yes X.05 2/2 VTS#1/GCMSD 10/20/05 1 Vapor Concentrations \* 159 Time (min.) 1 Modeling Grade 0 100 1 Corrected mass on 100% agent purity. 20 Data Evaluation Grade: Average air temperature above drop: 38.6 Mg Average substrate temperature: Mass % recovery by extraction. fotal agent % mass recovery. Mass of agent disseminated: Mass % recovery in vapor: Nominal drop volume: Daily CCV < +/- 15%; 0 Average air flow rate. Tube #s consistant: Date/Experiment # Type of substrate Number of drops: Test agent/punity instruments 0 000 Comments 0.20 0.25 0.15 0.10 0.05 Tunnel Em/gm ni OH

G:\AgentFateTechiWind Tunnel\Archieved Excel Sheets (NOT POLISHED)\HD GL(0+0-)\20051020\_3c\_38

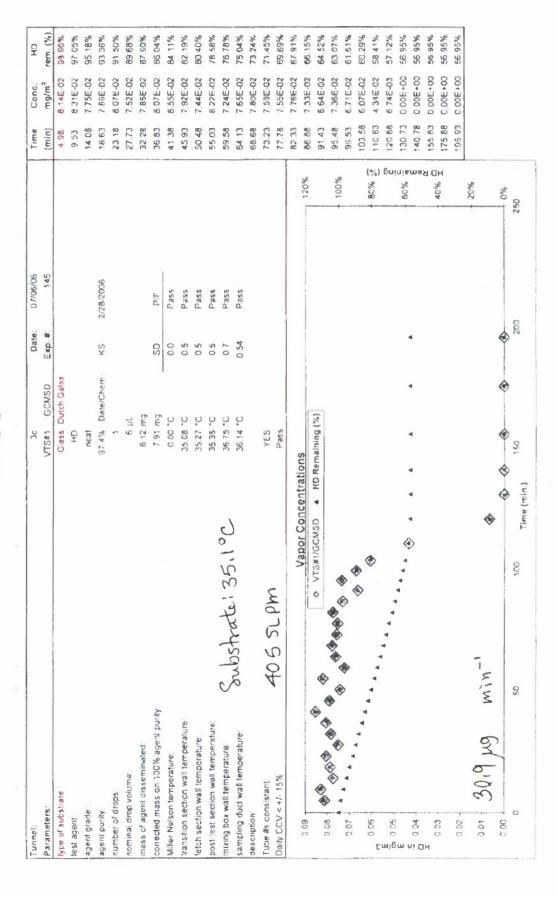
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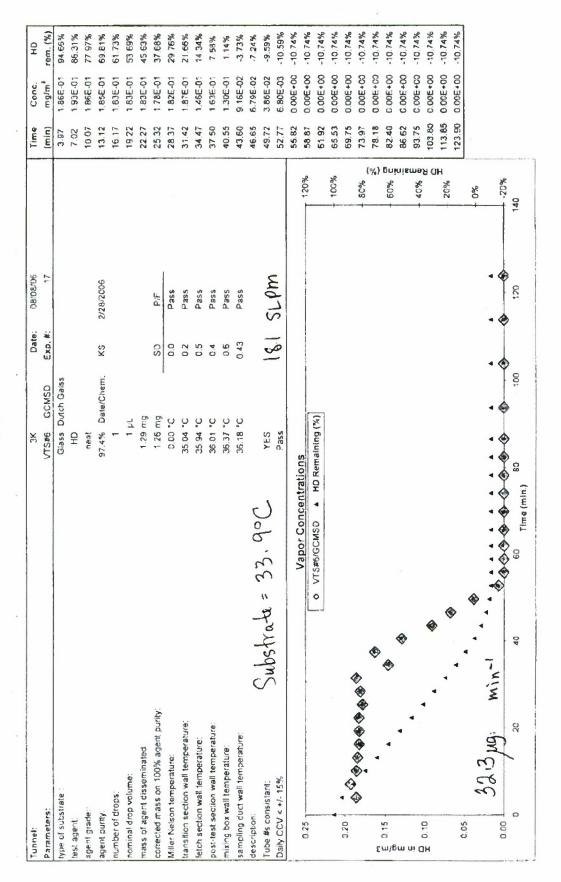
Tunne		88					(win)	ma/m3	rom (%)
Wind and a second	HINDPHAN AND AND ADDRESS.	FAMADSITE					577	1 745 01	07 CEC
Date/Experiment #		05/19/05 19		Agent Purity			30.32	1435-01	77 178
sizusque of adyl			CASARM	97 4%	2/28/2006		54.90	1.26E-01	57.30%
Test agenypurity		HD	Munitions	75.1%	1/18/2006		79.48	1 29E-01	38.45%
Number of drops		-	Munitions	78.2%	2/27/2006		104 07	1.23E-01	19,80%
Naminal drop volume:		6 µL					128.67	8.42E-02	4,43%
Mass of agent disseminated:		7.37 mg		Data Evaluation	uc		153 27	0.00€+00	-1.80%
Corrected mass on 100% agent punity.		7.18 mg	SD	%SD	Status		177.87	0.00E+00	-1.80%
Average substrate femperature:		35.58 °C	0.3	%35 O	°S		202 47	0.00E+00	-1.80%
Average air flow rate:		431 85 SLPM	б: e÷	0.45%	ô		227.05	0 00E+00	-1.80%
Average air temperature above drop		34.54 °C	0.3	0.86%	Go				
Mass % recovery in vapor.		101.8 %	٠		රි				
Mass % recovery by extraction:		1/3 %							
Total agent % mass recovery.		101.8 %							
Tube #s consistant.		Yes							
Daily CCV < +/- 15%:		No							
Comments		nfa							
900	Vapor Concentrations	ions				130%			
<b>&lt;</b>	♦ HEATED XFER LINE	UNIT ENT				6			
9						100%			
	♦						-		
<b>■</b>	>					80%			
0.10									
80 00 76 w	•					oinin			
u) QI	4					40% m			
0000						101			
0.04	4					20%			
0.02	•	4	•		4	0%			
2000 Mg	HILM	•	•		<				
30.7	de la company de	•	•	-	•	*02-			

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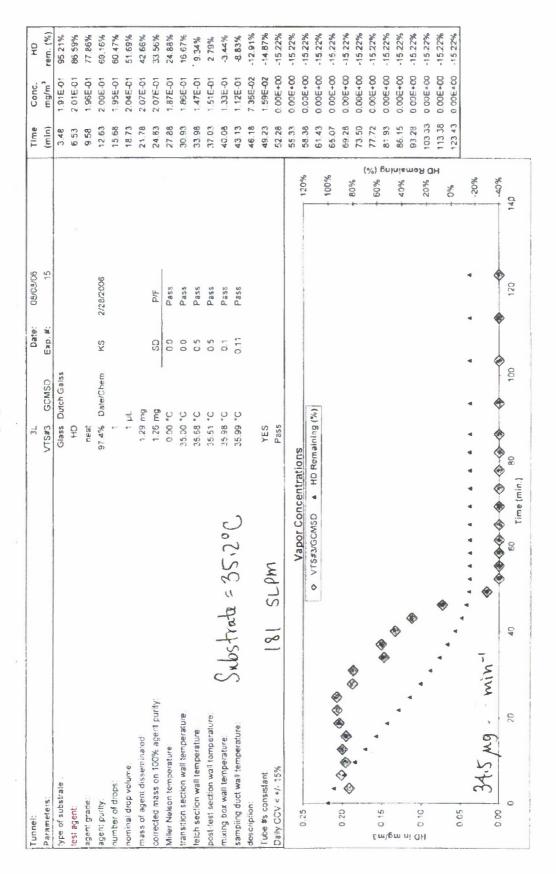
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20050519 3a 20

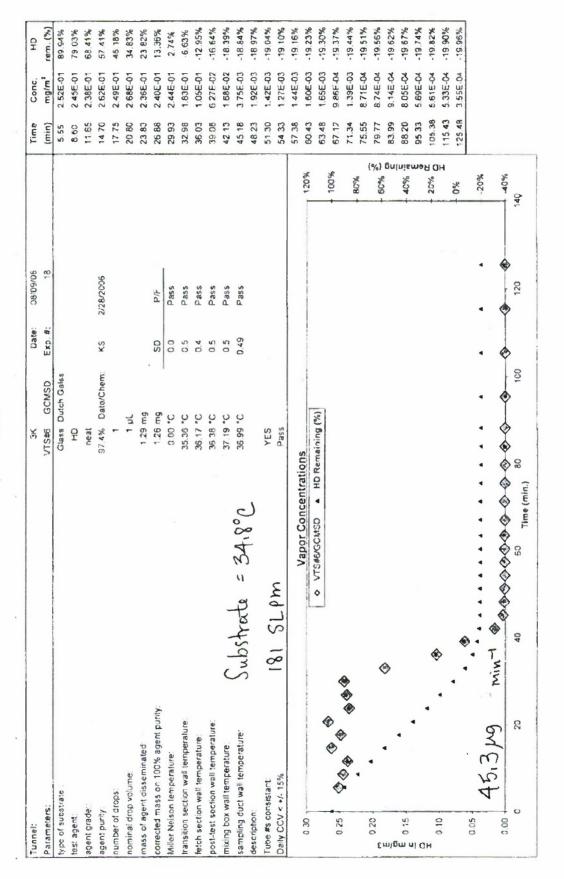




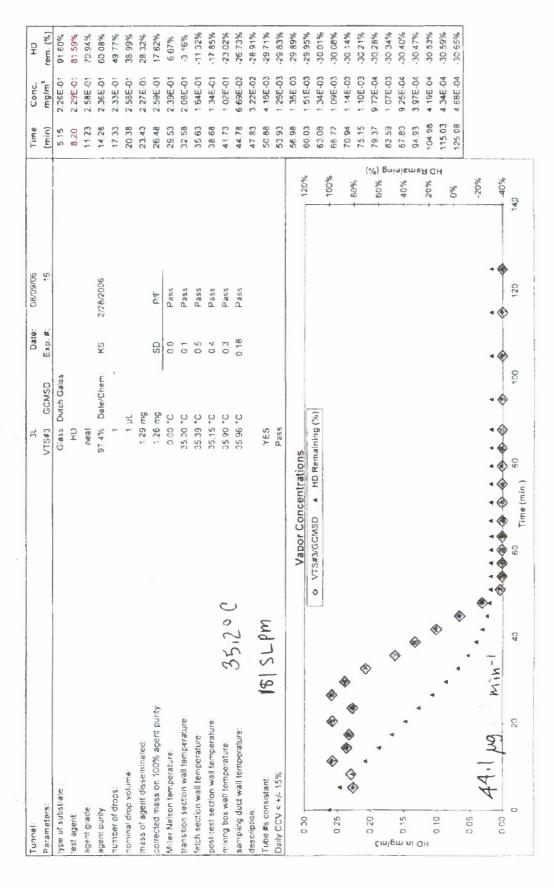
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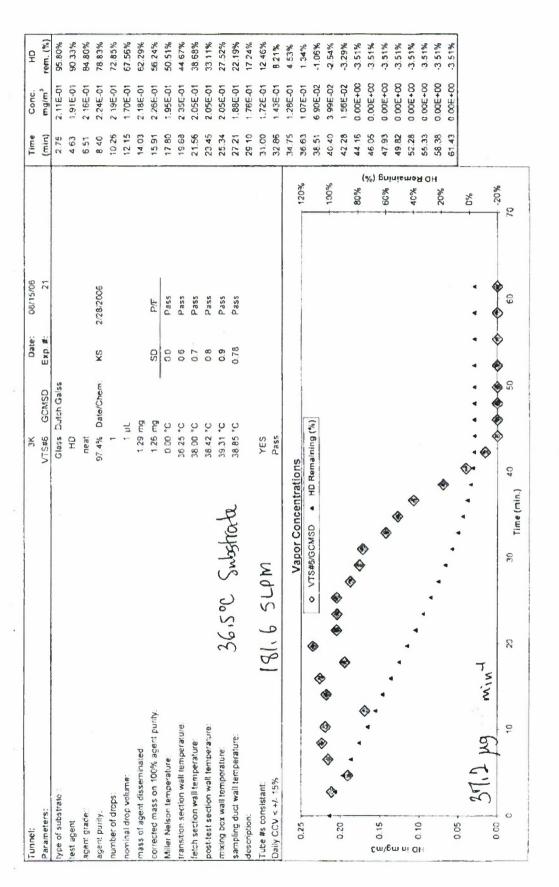
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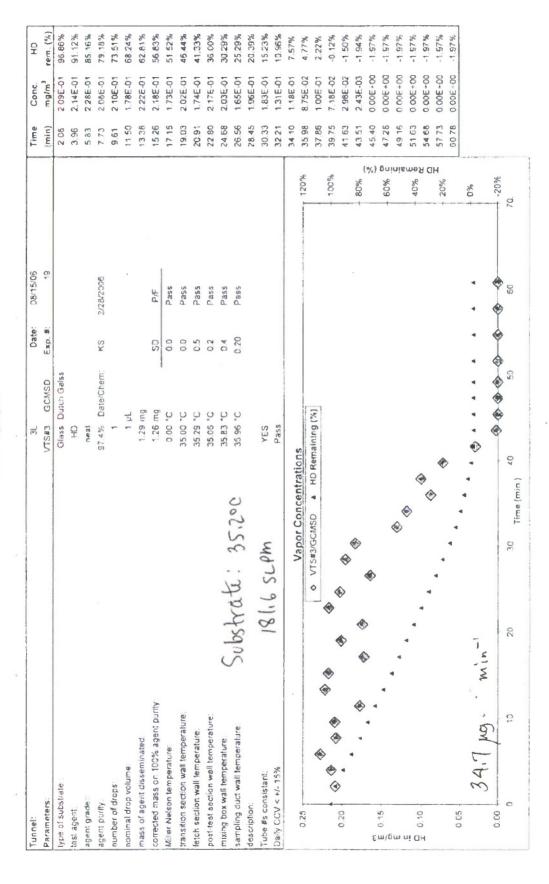
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G NagentFateTechtWind TunnelMrchieved Excel Sheets (NOT POLISHED)\HD GL(0≈0-)\20060815\_3K\_021



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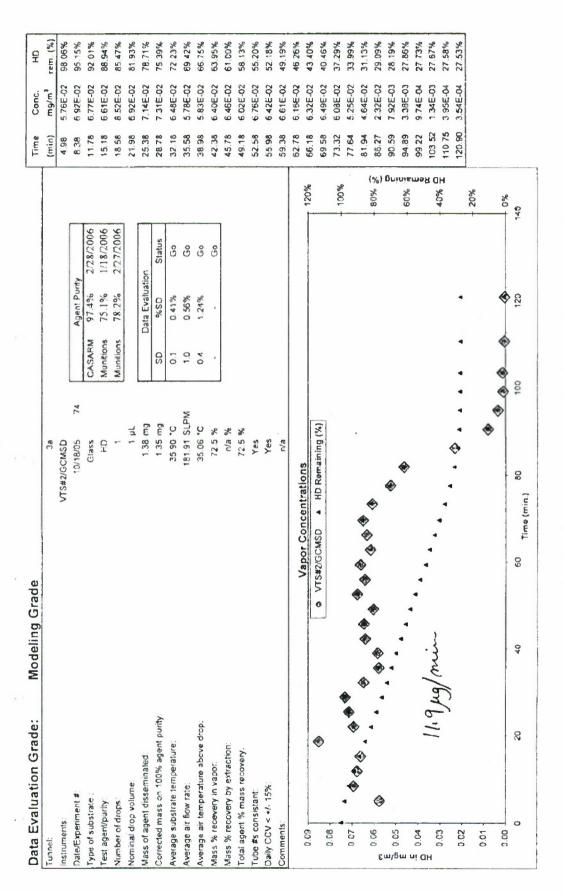
87.19% 53.83% 48.19% 32.04% 22.04% 37.49% 20.59% 17.68% 16,19% 14.90% 13.76% 11.09% 70.45% 59.41% 26.85% 19.11% 12.63% 42,74% 9.42% 8.44% 8.19% 8.12% 7 27E-02 7.69E-02 8.43E-02 0.000+00 7.04E-02 7.15E-02 7.80E-02 7.49E-02 7.77E-02 7.67E-02 7.92E-02 7.17E-02 7.39E-02 6.69E-02 6.62E-02 6.33E-02 5.09E-02 5.98E-02 5.52E-02 4.41E-02 4.38E-02 4.40F-02 3.77E-02 3.13€-02 9,135-03 1.21E-03 7.38E-04 6.55E-04 105.58 116.72 122.28 20.03 30.15 45.35 60.53 65.60 75.73 77.30 79.12 80.93 82.75 86.38 88 18 90.83 94.23 97.63 101.02 111.15 25.08 50.42 70.67 84.57 14.97 35.22 40.28 55,48 (%) gninismeR OH 100% 120% 80% 809 40% 20% 80 140 1/18/2006 2/27/2006 2/28/2006 Status ô 8 8 8 Data Evaluation 75.1% 97.4% 0.39% 0.87% **68%** 0.25% CASARM Munitions Munitions 16 SD 0.1 99 181.88 SLPM 1.27 mg 1.31 mg 35.12 °C 74 34.96 °C 92.0 % % e/u ♦ VTS#2/GCMSD A HD Remaining (%) 92.0 % X es Glass 皇 VTS#2/GCMSD 09/13/05 Vapor Concentrations 80 Time (min.) 09 Modeling Grade 40 Corrected mass on 100% agent punity. Data Evaluation Grade: Average air temperature above drop. 20 Average substrate temperature: Mass % recovery by extraction: Total agent % mass recovery. Mass of agent disseminated: Mass % recovery in vapor. dominal drop volume. Average air flow rate: Daily CCV < +f. 15% Tube #s consistant: Sate/Experiment # yoe of substrate est agent/purity: Jumper of drops; instruments. 0 Comments. 0.07 00.0 0.08 0.01 0.09 90.0 0.03 0.02

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20050913\_3a\_56

Tunnei:   3c	4 E E C 20 7 % % %	Agent Purity 75.1% 2 100s 78.2% 2 Deta Evaluation 8.097% 8 0.97%	rity 2/28/2006		5.92 10.98	mg/m³	rem. (%)
VTS#1/GCMSD 09/13/05 Class HD 1 1 μL 1.37 mg 1.34 mg 35.19 °C 181.60 SLPh 35.25 °C 81.2 % Na % 81.2 % Yes No	17 E E S S S S S S S S S S S S S S S S S				5.92	7 REF. 02	DE 85%
09/13/05 Class HD 1 1 11 137 mg 1.34 mg 35.19 °C 181.60 SLPh 1.2 % N/a / N/a	22 A 2 C C C C C C C C C C C C C C C C C				10.98	V VVV. VR	2000
			2/28/2006			8.61E-02	%61 16
					1607	6.78E-02	85.88%
			1/18/2006		21.13	7.52E-02	80.83%
			2/27/2006		26.20	9.05E-02	74.99%
					31.27	8.69E-02	68.89%
			ation		36.33	7.98E-02	63.16%
			Status		41.40	1.63E-02	\$98.65
	address, deliberations, and		Go		46.48	4.16E-02	57.87%
			Go		51.55	6.69E-02	54.14%
extraction: recovery:		3 0.77%	Go		29 99	7.67E-02	49.20%
recovery:	7 8 8 7 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8		Go		61.68	8.41E-02	43.58%
recovery:	81.2 % Yes				86.75	8.48E-02	37,87%
	Yes				71.82	7.79E.02	32.28%
	No				76.88	6.76E-02	27.27%
					78.47	5.55E-02	25.95%
	r/a				80.28	5.13E-02	24 63%
					82.10	4.43E-02	23.45%
Table College		was allowed as were clumber and stable to the financian stable of		120%	83,93	4 13E-02	22.39%
0.09 A NU Nemaining (%)	C Kemaining (%)			some various on the	85.75	3,43€-02	21.46%
				100%	87.57	2.94E-02	20.67%
◆ ◆ ◆					89.38	6.17E-03	20.24%
	<				92.03	1.44E-02	19.87%
	<b>∌</b>			%) %08	95,43	8.05E-03	19.35%
©	6			δυ <u></u>	98.83	1.77E-03	19.12%
900				+ 60% a	102.23	1.22E-03	19.05%
				wo	106 80	7.84E-04	18.99%
min or	» *				112.38	7.90E-04	18.93%
•				H	117.95	8.55E-04	18.87%
4	, , ,				123.52	8.10E-04	18.81%
•	•	4	4	+ 20%			
♠ ♠	**	<b>®</b>	4	ž	Comment and the same		
0 20 40 60	80 100	•		148	No. of Section		
( Lime ( min )					-11-80		

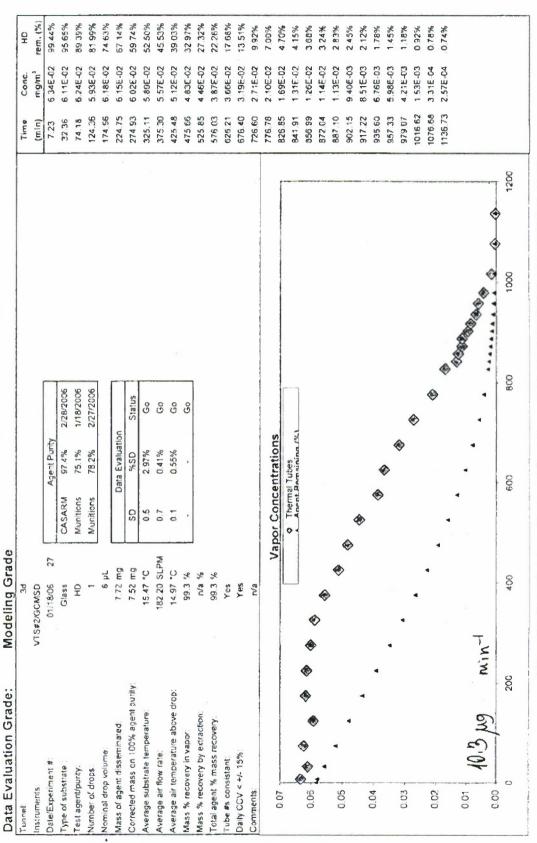
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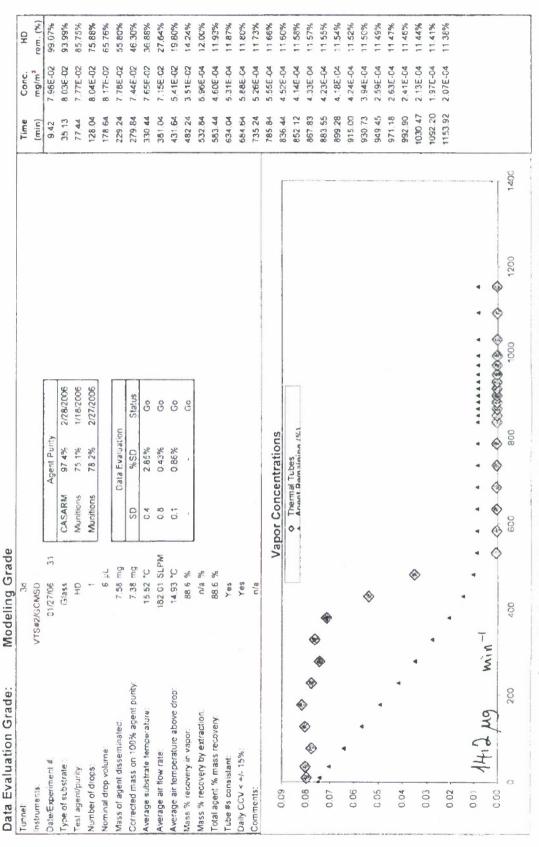
G:\AgentFateTech\Wind Tunnel\Archieved Excel Sheets (NOT POLISHED)\HD GL(0-0-)\20051018\_3a\_74.

Data Evaluation Grade:	Test Grade						Time	Conc.	H
Tunnel		3d					(mim)	mg/m³	rem. (%)
Instruments		HEATED XFER LINE MAPSITE					116.50	9.45E-03	98.68%
Date/Experiment #		11727/05 9		Agent Punity		and reasons	190.50	1 65E-02	96 38%
Type of substrate:		Glass	CASARM	97 4%	2/28/2006		265.50	1.26E-02	93.77%
Test agent/purity.		Q.	Muntions	75.1%	1/18/2006		339.50	1.65E-02	91,19%
Number of drops		-	Munitions	78.2%	2/27/2006		413.50	1.89E-02	88.06%
Nominal drop volume:		6 µl.				-	487.50	1.26E-02	85.27%
Mass of agent disseminated		7.80 mg		Data Evaluation	U.	***************************************	562.50	1.18E-02	83.08%
Corrected mass on 100% agent purity:		7,60 mg	SD	CS%	Status		639.50	1.65E-02	80.47%
Average substrate temperature.		15,10 1C	5.0	1.01%	Go		714.50	7.09E-03	78.35%
Average air flow rate.		181.67 SLPM	0.5	0.25%	Go		788.50	1.57E-02	75.33%
Average air temperature above drop:		13.82 °C	0.2	1.49%	Go		862 50	1.81E-02	73,33%
Mass % recovery in vapor.		31.4 %	٠		3		937.50	1,735-02	70,15%
Mass % recovery by extraction		Na %					1011.50	0.00E+00	68.62%
Total agent % mass recovery.		31.4 %					1085.50	0.00E+00	68.62%
Tube #s consistant:		Yes					1153 50	0 00E+00	68,62%
Daily CCV < +/- 15%:		OZ							
Comments		7/0							
		Vanor Concentrations							
0 02	8	A DEATED VECTORING				120%			
0 02	<b>₽</b>	A HD Remaining (%)							
•	•	•				100%			
0.02	•	•							
0.01	4	4							
£m Co	•					%) E			
			4	4					
₩ ni 0.01						- 60% iien			
OH-						ен			
C		❖				40% HD			
00.00						+ 20%			
2,6 Ma . M.	MIN-I								
			*	*	The second secon	%0 T			
0 200	400	600 Fime (min.) 800	1000	1200	ř	1400			
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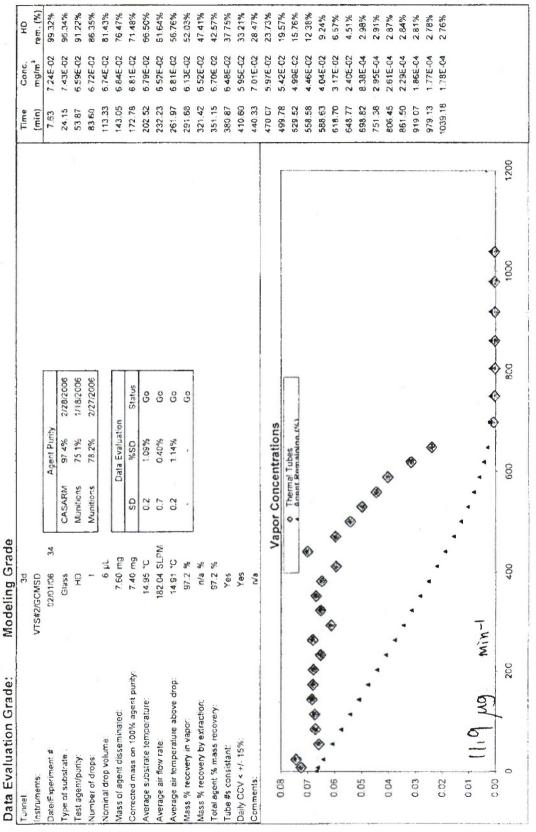
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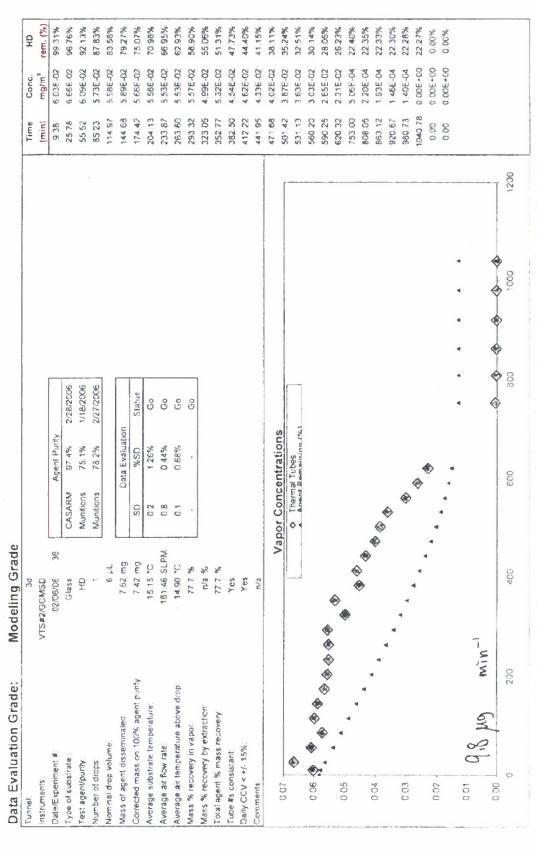
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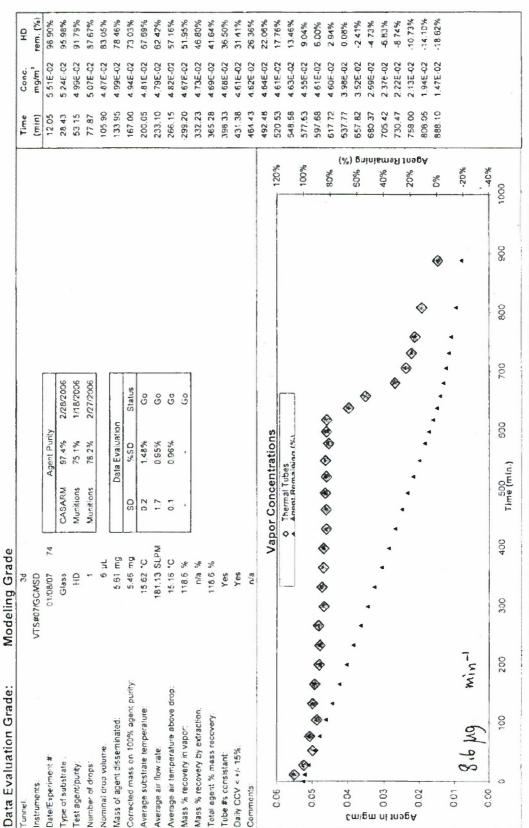
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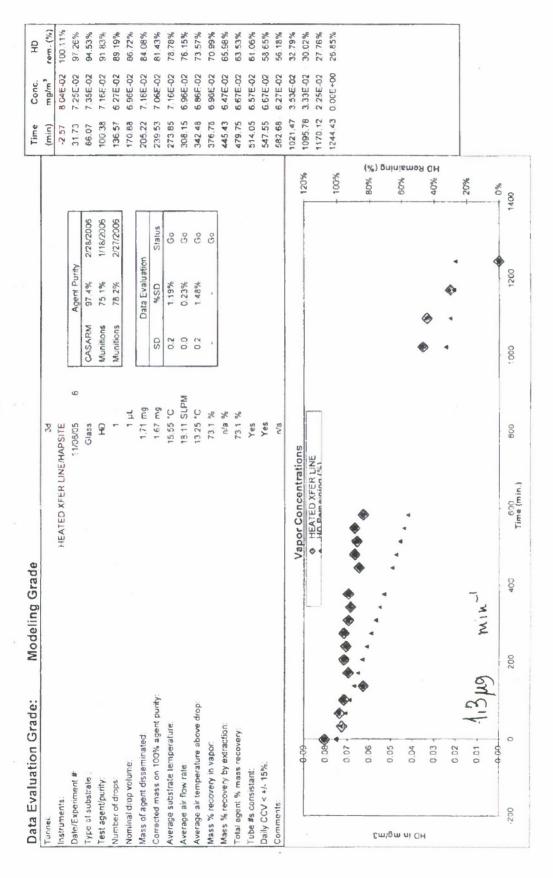
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G: AgentFateTech/Wind Tunnel/Archieved Excel Sheets (NOT POLISHED) HD GL(-00-)/20070108\_3d\_074



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20060110\_3d\_24

## Data Sheet Droplet Evaporation in ECBC Wind Tunnel

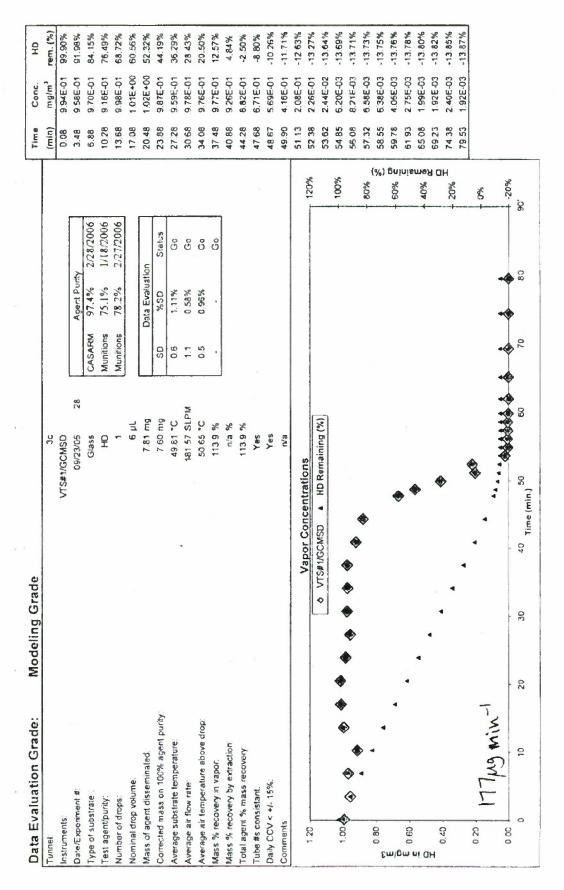
 Tunnel:
 3d

 Date:
 January 5, 2006

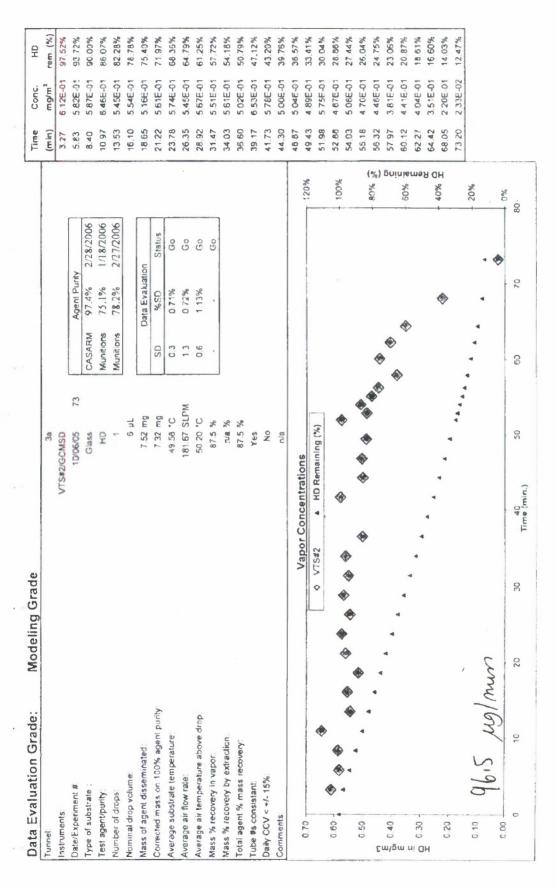
 Experiment Number:
 22

 File Name:
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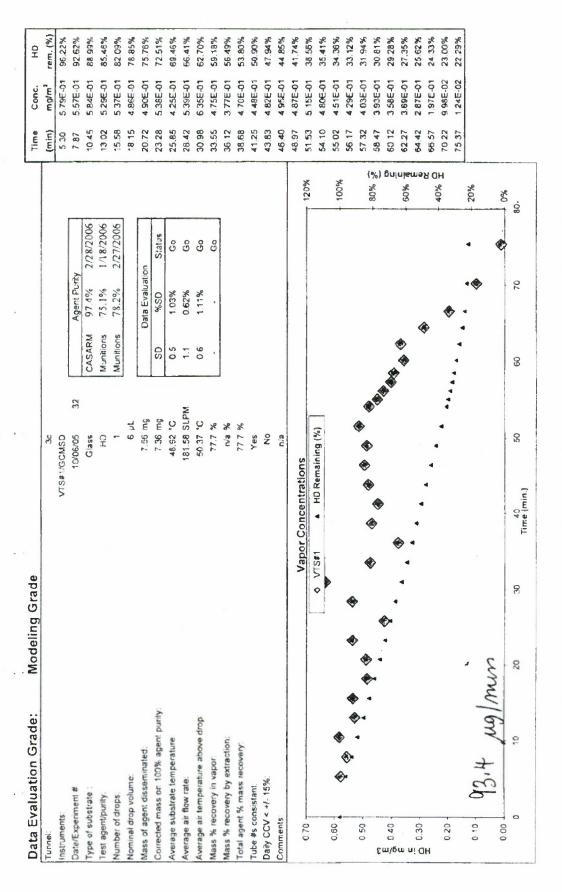
rne ivane:	20000105_3d_22.xts
Subs	trate
type of substrate:	Glass
substrate sample size (mm):	36.6 0.00105 m <sup>4</sup>
Ag	ent
test agent:	HD
agent neat / thickened:	neat
agent purity:	97.4%
nonminal density:	1.27 mg/uL
	ination
number of drops:	1
nominal drop volume:	l μl.
actual calculated drop volume:	0.969 μL
weight of clean substrate:	1846.316 mg
weight of contaminated substrate:	1847.547 mg
mass of agent disseminated:	1.231 mg
corrected mass on 100% agent purity:	1.199 mg
actual contamination density:	1.17 g/m²
actual contamination density based on 100% agent purity:	1.14 g/m°
	arameters
Miller Nelson temperature:	50.5 °C 0.1
air flow temperature:	15.0 °C 0.1
Aalborg Flowmeter air flow rate:	18.08 SLPM 0.0
transition section wall temperature:	13.0 °C 0.0
fetch section wall temperature:	12.1 °C 0.3
substrate temperature:	15.1 °C 0.1
piston zone temperature:	9999.0 °C 0.0
post-test section wall temperature:	18.8 °C 0.4
mixing box wall temperature:	35.0 °C 0.0
sampling duct wall temperature:	35.1 °C 0.2
test section air flow speed:	0.15 m/s 0.0
air flow relative humidity:	0.00 % 0.0
Sampling 1	arameters
sampling technique:	VTS#2
introduction technique:	UNITY/ULTRA
analysis technique:	GCMSD
Experime	nt Timing
start time contamination (time drop hits substrate):	01/05/06 16:02:30
end time contamination:	Delta
start time data acquisition (desired wind velocity achieved):	01/05/06 16:06:06 3,60 min.
end time data acquisition- end of vapor experiment:	01/06/06 09:21:55 1035.82 min.
Additional	Information
weight of substrate after evaporation;	1846.3180 mg 15:30 on 1-06-06
residual mass of agent after evaporation:	0.0020 mg 1 1/Q / M/4
	on liquid
extraction liquid:	n/a
volume extraction liquid:	n/a mL
extraction time (ultrasonicate):	n/a min
concentration of agent in extraction liquid:	n/a µg/ml.
recovered mass:	n/a mg
	arks
drop delivered by:	Ken Sumpter
	Inus Ross, Inus targe 1
	low flow, low temp, 1
description:	mic on glass, Terry
	delivers drop, new
	coolant flow config (dual
.,	loop), VTS 2 connected
video munitoring: 20060105	3d 22.xls YES



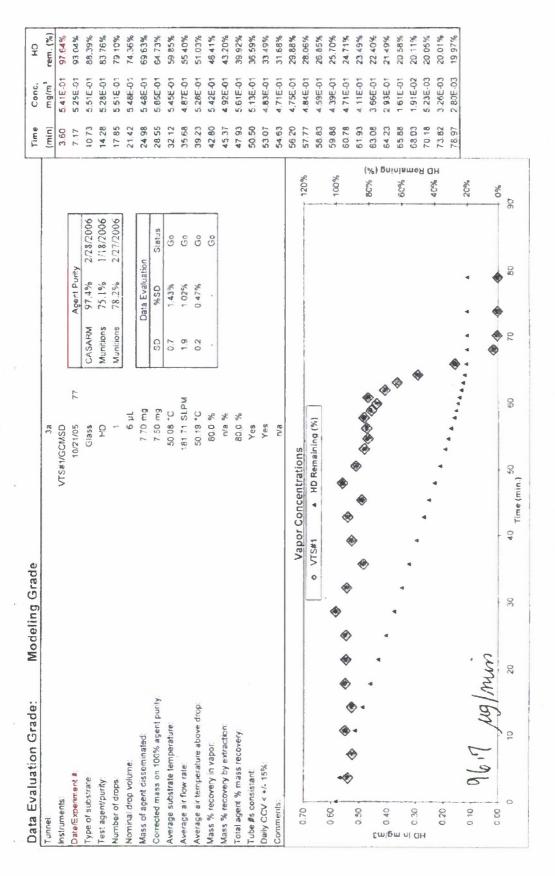
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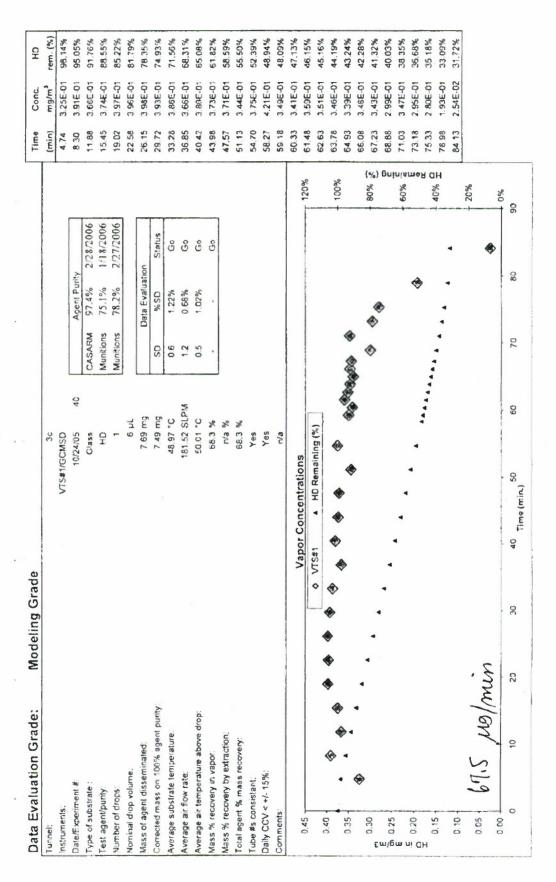
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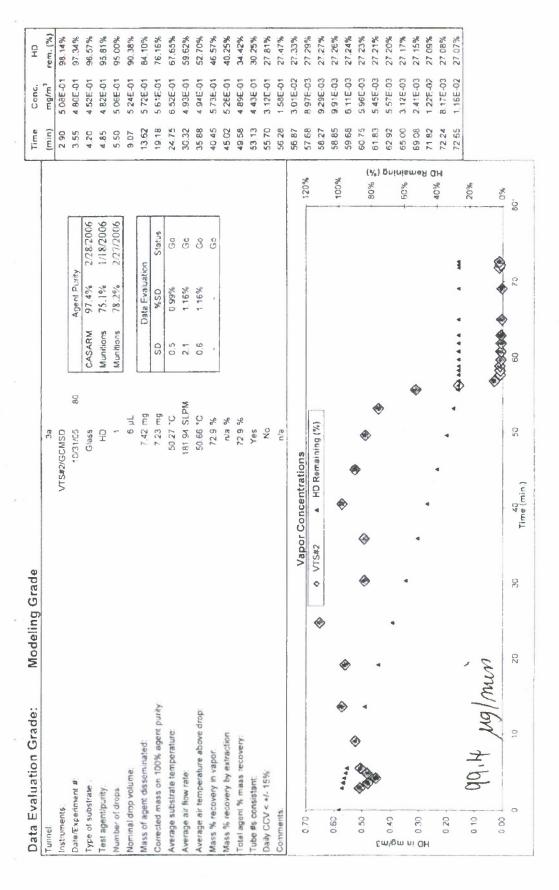
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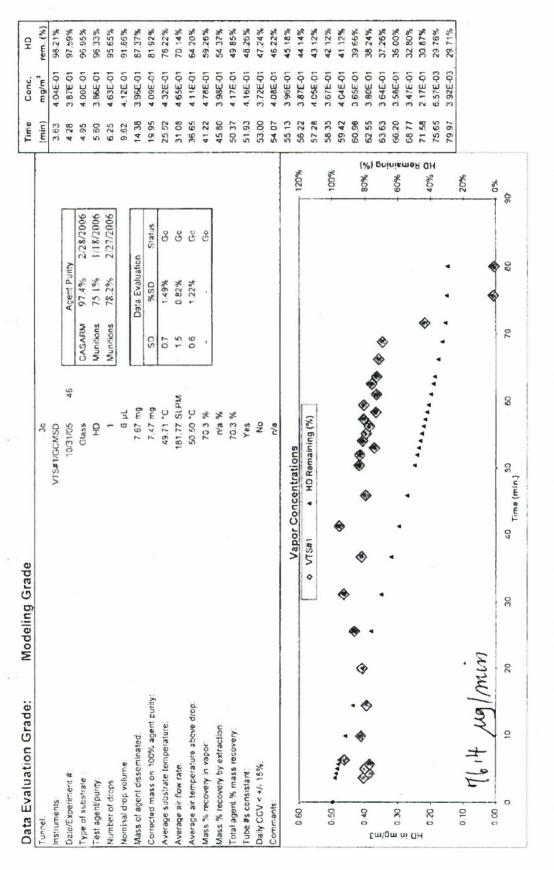
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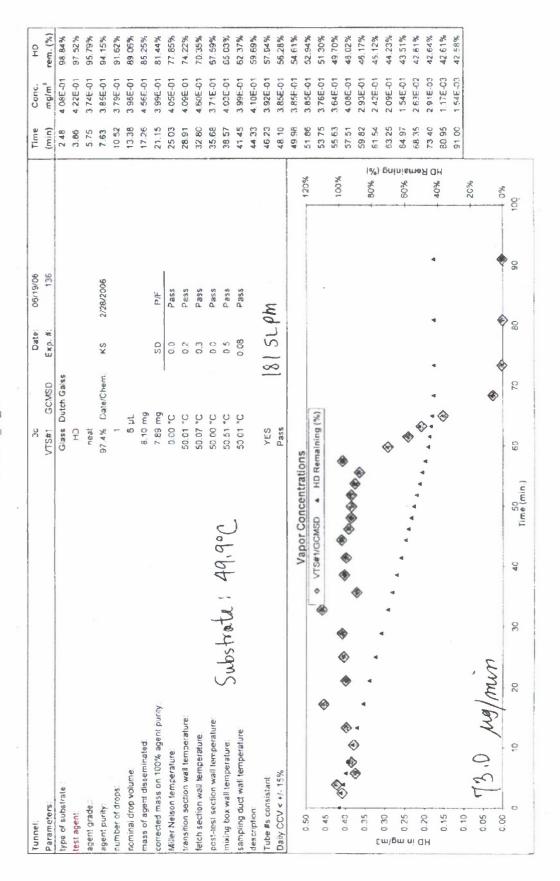
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G/AgentFateTech/Wind Tunnel/Archieved Excel Sheets (NOT POLISHED)/HD GL(+00-)/20051031\_3a\_80

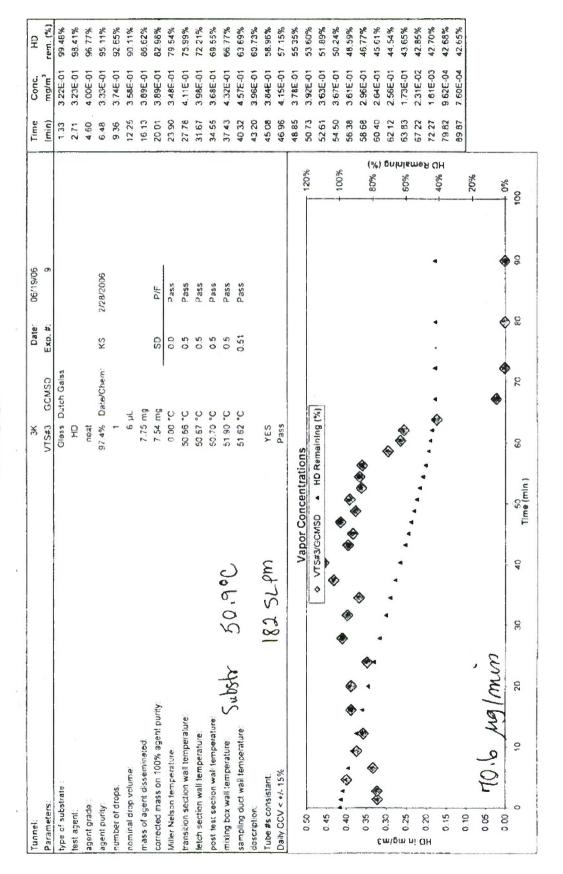


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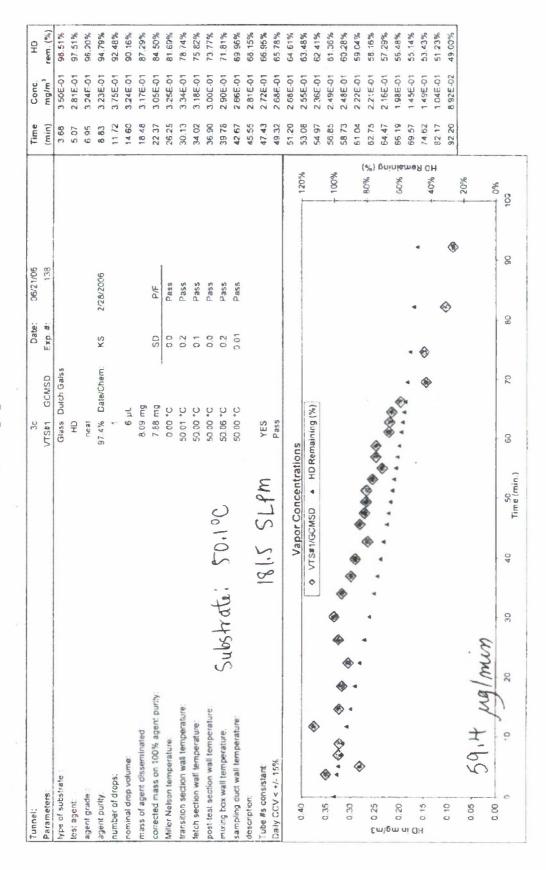


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20060619\_3k\_009

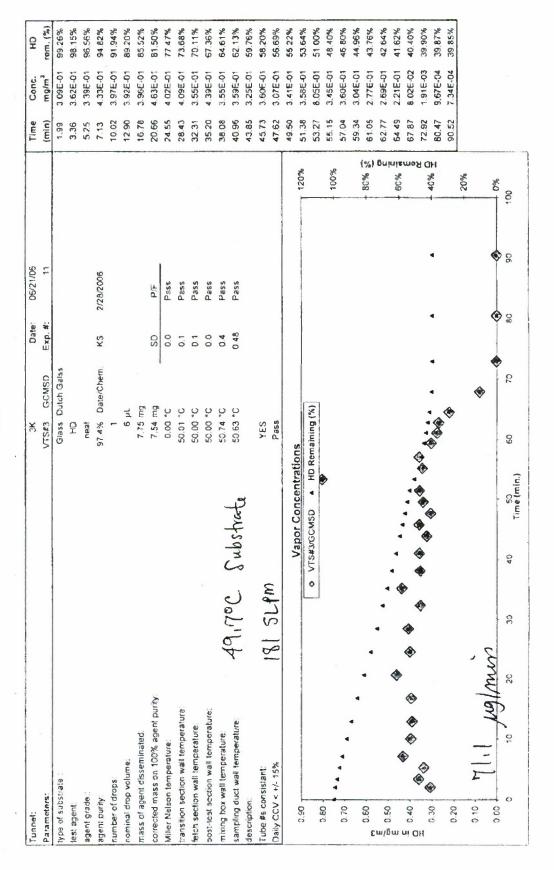


G 'AgentFateTech'Wind Tunne!\Archieved Excel Sheets (NOT POLISHED)\HD GL(+00-)\20060619\_3k\_009

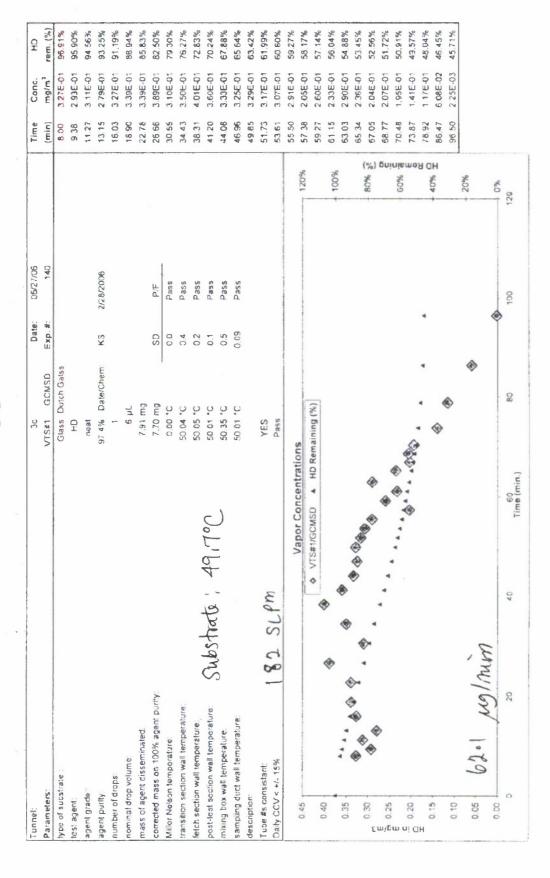


G \AgentFateTech\Wind Tunnel\Archieved Excel Sheets (NOT POLISHED)\HD GL(+00-)\20060621\_3c\_138

20060621\_3k\_011

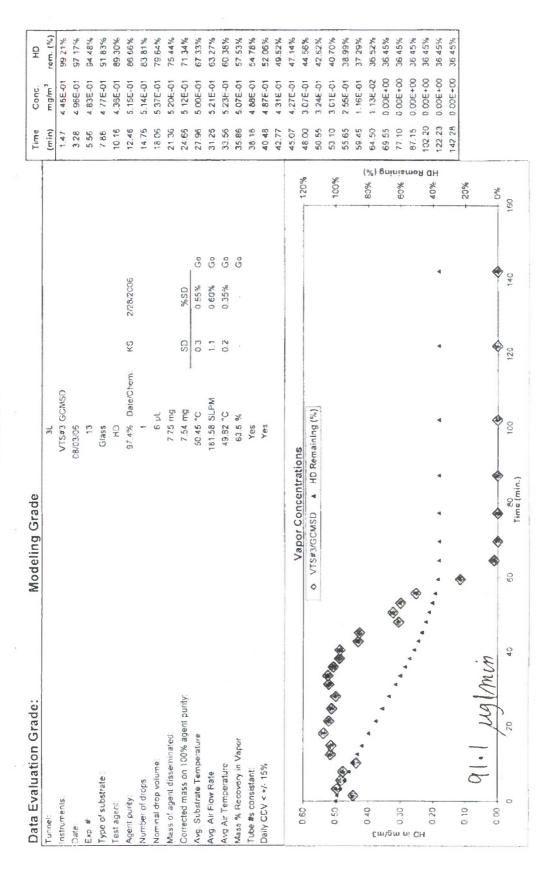


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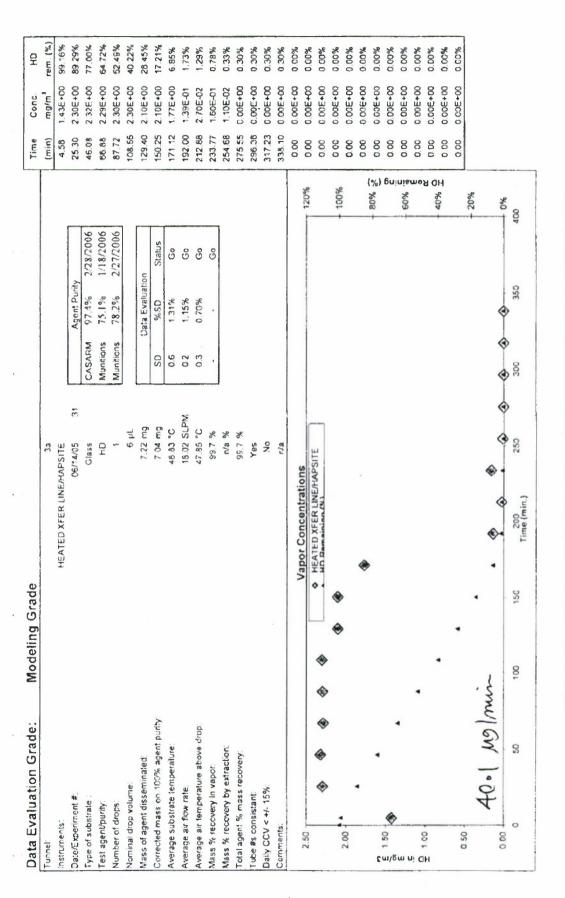


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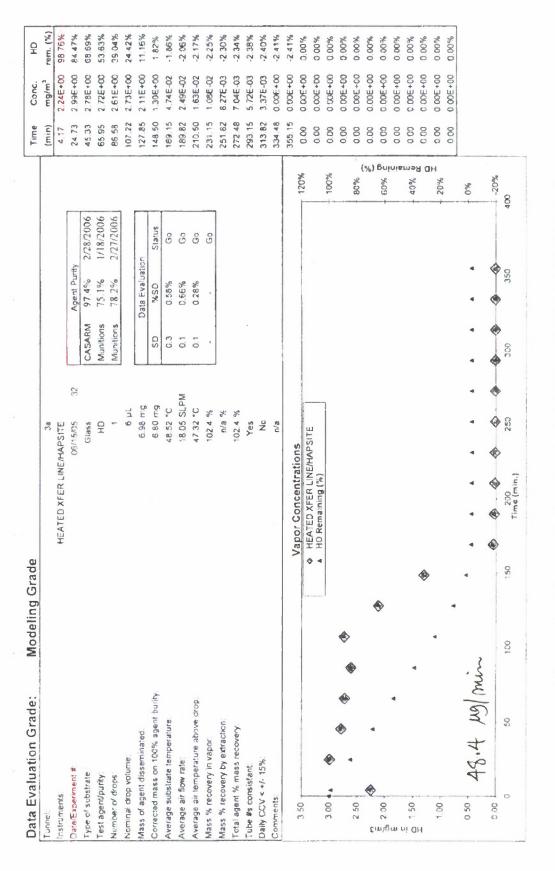
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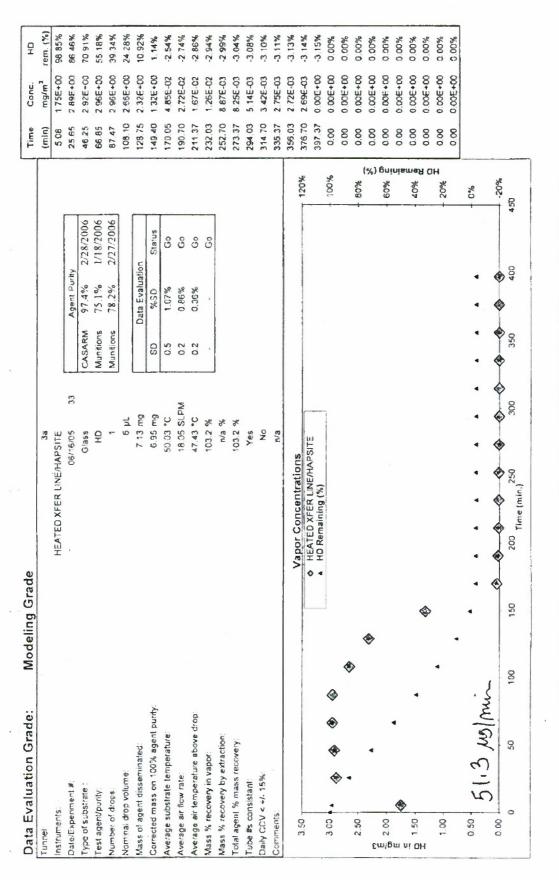
G \AgentFateTech\Wind \ \frac{7}{2}\text{unne\Archieved Excel Sheets (NOT POLISHED)\IHD GL(+00-)\I20\60803\_3\rac{1}{2}013



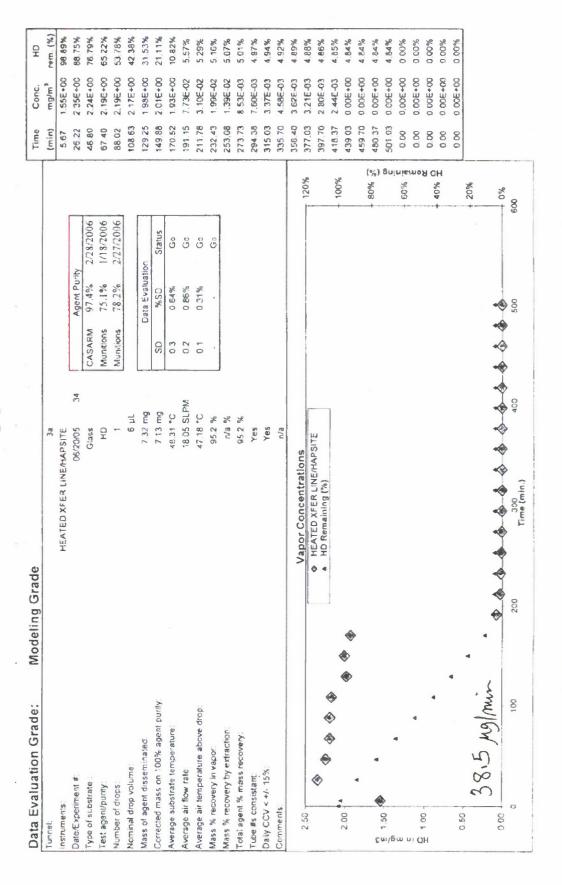
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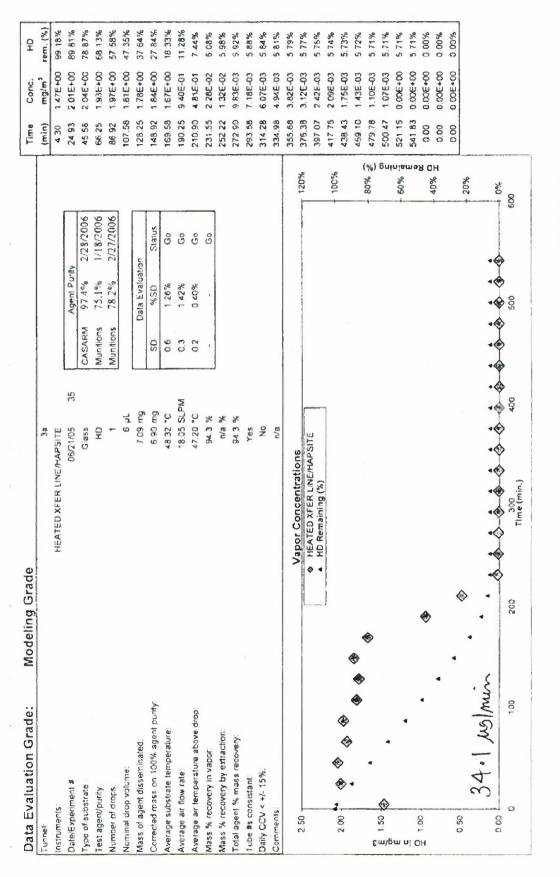
G WgentFateTechiWind TunnelMrchieved Excel Sheets (NOT POLISHED)IMD GL(+0--))20050615\_3a\_32



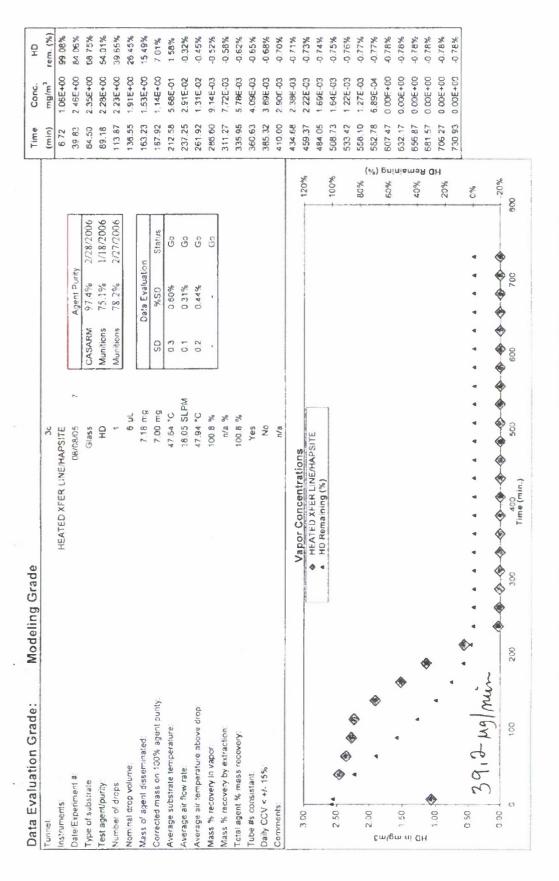
G:\AgentFateTech\Wind Tunne\\Anchieved Excel Sheets (NOT POLISHED)\\HD GL(+0--)\\\20050616\_3a\_33



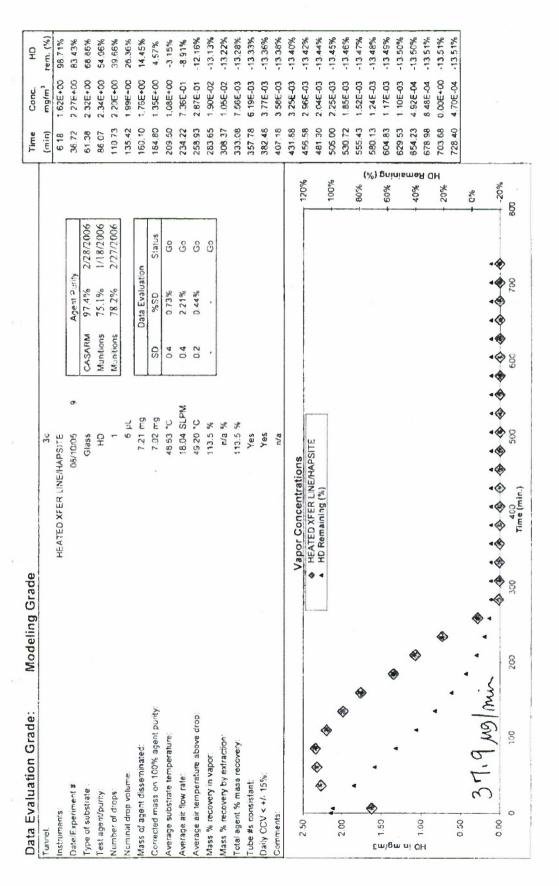
G. Agent Fate Tech Wind Tunnel Archieved Excel Sheets (NOT POLISHED) HD GL(+0--)/20050620\_3a\_34



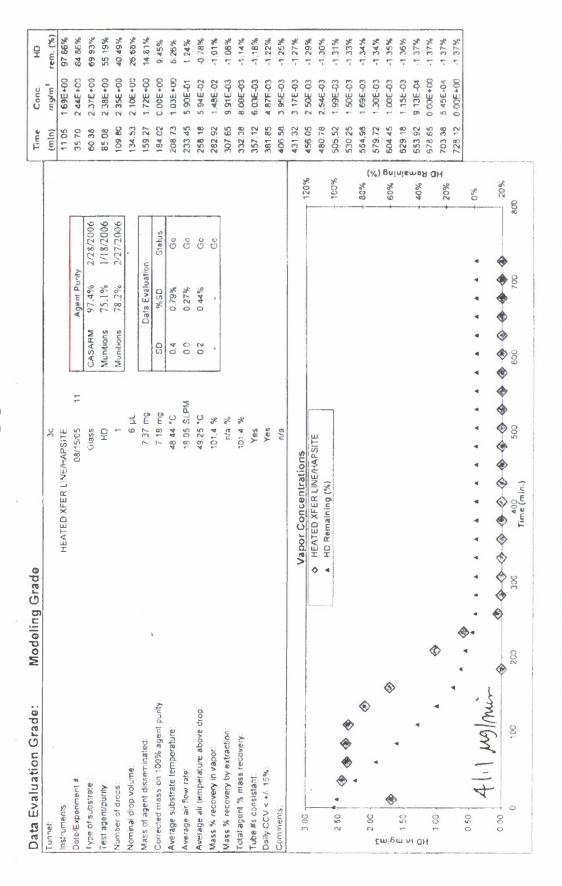
G: Agen: FateTech!Wind Tunne! Archieved Excel Sheets (NOT POLISHED)! HD GL(+0--) 200550621\_3a\_3\$



G:V8gentFateTech!W/ind Tunnel!Archieved Excel Sheets (NOT POL!SHED);HD GL(+0--);20050808\_35\_07.



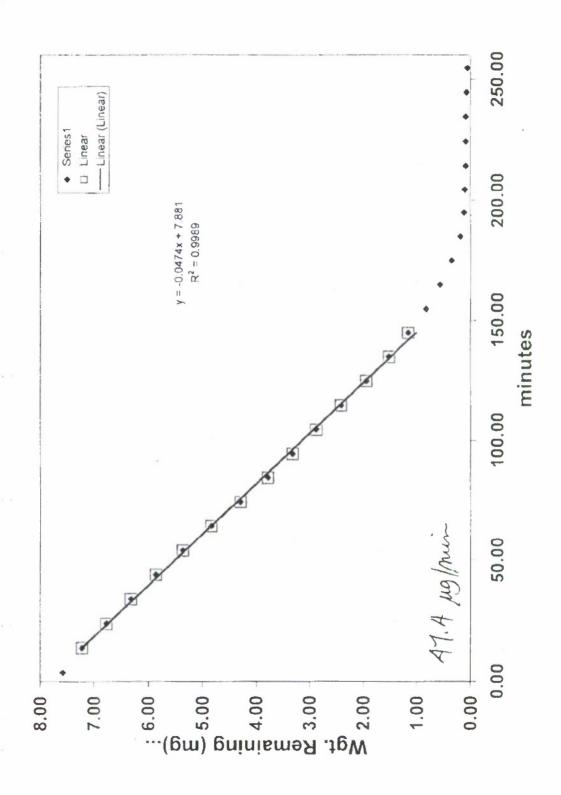
G.\AgentFateTech\Wind Tunne\Varchieved Excel Sheets (NOT POLISHED)\HD GL(+0--)\20050810\_3c\_09



G:\AgentFateTech\Wind Tunne\\Archieved Excel Sheets (NOT POLISHED)\\U00a4\OUN\\\U00a40-\\\U00a40050815\_3c\_11.

## Data sheet droplet evaporation in ECBC Tunnel 3a

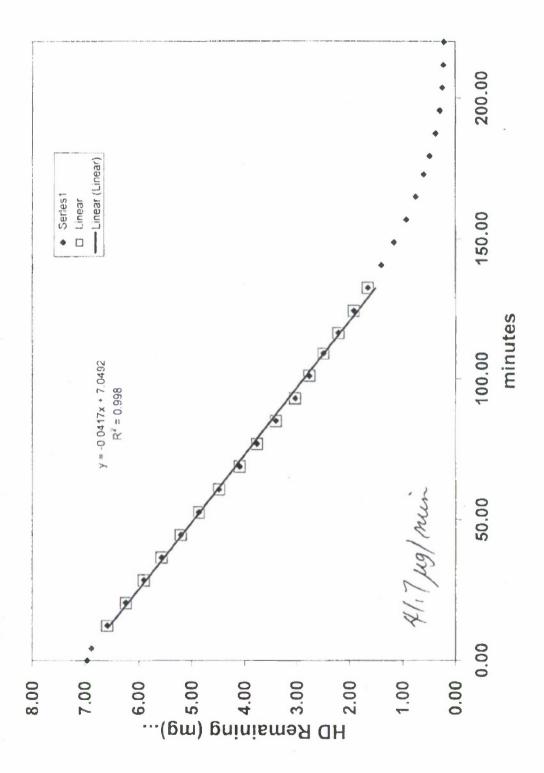
DATE:	18-Aug-2005				
ECBC FILESERVERNAME:	rgockol on 'Fileser'(	WWSnamuniClass	\ Brank(?	0050818-3	a Slick
LABVIEW FILENAME	B\$150\C:\Tunnel\3a			-	277 (438
	\$51	(2003)20030818_3	M*1. X13		
XP. No.:	351			1	
Substrate				1	
ype of substrate:	36,6mm diameter	valley design, 1.45	001052	nt'	ing to protoco
Agent	20000000			1	
ext liquid	dil			J	
gent neal / thickened:	tient				
gent parity		nominal density is		1.2	7 mg/st.
Contamination					
umber of drops	1				
ruminui drup veilume urtual calculated drup veilume	6,174	μl. }			
seight of clean substitute	1728.566				
velight of contaminated substrate:	1736.407				
nass of agent disseminated	7,341				
mass of agent dissertanced corrected mass on 100% agent purity		mg  of like% Age	nt.		
citial contamination density		[g/m <sup>2</sup> ]	1		
cital contamination density recolculated on 100% agent parity.		[8,01,]			
CONTROL PARAMETERS	S set up	ncinal menu	value	Units	± stilev
lifler Nelson Temperature			49.3		0.5
r flow temperature.			50.0	°C	0.2
alborg Flowincier air flow rate			18.14	SLPM	0.0
lowmeter corrected flow rate		#DIV/0!		Versiers	NOIVION
ransition section wall temp. (cone)			55.9	°C	0.1
etck section wall temp(finnt)			55.0	*C	9,1
abstrate Temperature			50.7		1.1
isten zone temperature (Pisten)			54,9		1.1
ost-rest section wall temp			50.0		0.0
ixing box wall lemp.			50.1		0.3
ampling duct wall temp (Vent)?			50.0		0
			0.24		1) 0
r flow relative humidity (Roironie). Simpling set up			9,24 1,59		0.1
est section air flow speed in flow relative humidis (Romane):  Simpling set up /ersatile Tube Sampler prototype#1 Tubes Auto desorbed by Mickes Ultra (ECBC haircode C5491) artache Desorlied analyte wits analyzed by Agrient 5890N gas chromatograph [YFED was Meloy Linbs Model PA 260 Analyzer (ECBC barcede 351	(ECBC barcode C5206		1.59	%,	0.1
ir flow relative humidity (Roironie):  Stimpling set up  Versaule Tube Samplier prototypell 1  Tubes Auto desorbed by Markes Ultra (ECBC harcode C5491) attach  Desorlied analyte was analyzed by Agrient 5899N gas chromatograph  [YFED was Meloy Labs Model PA 260 Analyzer (ECBC barcode 351  Experiment timing	(ECBC harcode C5206 58) - set at 10 <sup>4</sup>		1.59	%,	0.1
in flow relative humidity (Roironic):  Sampling set up  Fersatile Tube Sampler prototype#1  Tubes Auto desorbed by Mackes Ultra (ECf3C harcode C5491) attach  Desorlied analyte was analyzed by Agrient 5890N gas chromatograph  [YFED was Meloy Labs Model PA 260 Analyzer (ECBC barcode 351)  Experiment timing  tart time contamination (time drop hits substrate).	(ECBC barcode C5206 58) - sei at 10 <sup>-4</sup>		1.59	%,	0.1
Flow relative humiday (Romane):  Sampling set up ensatile Tulic Sampling prototype!!  Fuber Auto described by Markes Ultra (ECBC harcode C5491) attach Described analyte was analyzed by Agrient 5890N gas chromatograph YFED was Meloy Labs Model PA 260 Analyzer (ECBC harcode 351 Experiment timing ant time contamination (time drop hits substrate).	(ECBC harcode C5206 58) - set at 10 <sup>4</sup>		1.59 le C549;	%,	0.1
Row relative humiday (Romonic):  Sampling set up resaltle Tubs Sampler prototype#1 ubes Auto described by Markes Ultra (ECBC harcode C5491) attach ubes riced analyte was analyzed by Agrient 5890N gas chromatograph yFED was Meloy Labs Model PA 260 Analyzer (ECBC barcode 351  Experiment timing attitioe contamination (time drap hits substrate), d tune contamination: In time data acquisition(desired wind velocity achieved).	(ECBC barcode C5206 58) - set at 10 <sup>4</sup> 08/18/05 14:54:49		1.59 le C5497	%	0.1
Sampling set up creative humiday (Romonic):  Sampling set up creatile Tulk Sampling set up creating the Sampling set up creating analyte was analyzed by Agrient 5890N gas chromatograph YFED was Meloy Labs Model PA 260 Analyzer (ECBC barcode 351 fx.periment timing ant time contamination (time drap hits substrate), and time contamination:  art time data acquisition end of varor experiment:  Additional information	(ECBC barcode C5206 58) - set at 10 <sup>4</sup> 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02	) with FPD)	3.03 302,33	% and we so	0.1
r flow reintive humidity (Roironie):  Simpling set up ersatile Tube Sampler prototype#1 Tubes Auto described by Markes Ultra (ECBC harcode C5491) attach Described analyte was analyzed by Agrient \$890N gas chromatograph YFED was Meloy Labs Model PA 260 Analyzer (ECBC barcode 351 Experiment timing ant time contamination (time drap hits substrate), and time data acquisition(desired wind velocity achieved), at time data acquisition end of vajor experiment:  Additional informatic eight of substrate after evaporation:	(ECBC barcode C5206 58) - set at 10* 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 90 1728.5530	(g) measured at 31	3.03 302,33	% and we so	0.1
e flow relative humiday (Romone):  Sampling set up ersatile Tulk Sampler prototype#1 Tubes Auto desorbed by Markes Ultra (ECBC harcode C5491) attach Desorlied analyte was analyzed by Agrient \$890N gas chromatograph YFED was Meloy Labs Model PA 200 Analyzer (ECBC harcode 351  Experiment timing ant time contamination (time drop hits substrate), and time contamination: ant time data acquisition(desired wind velocity achieved), and time data acquisition-end of vapor experiment:  Additional information eight of substrate after evaporation: sidual mass of 'agent' after evaporation:	(ECBC barcode C5206 58) - set at 10 <sup>4</sup> 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02	(g) measured at 31	3.03 302,33	% and we so	0.1
Entriction liquid  Tolow relative humiday (Romane)  Sampling set up  ensatile Tulk Sampling prototype#1  Tubes Auto desorbed by Markes Ultra (ECBC harcode C5491) attachy Desorlied analyte was analyzed by Agrient 5890N gas chromatograph  yFED was Meloy Labs Model PA 200 Analyzer (ECBC harcode 35)  Experiment timing ant time contamination (time drap hits substrate), and time contamination; art time drap acquisition; end of vapor experiment:  Additional informationship of substrate after evaporation;  eight of substrate after evaporation;  Extraction liquid	(ECBC barcode C5206 58) - set at 10* 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 90 17/28/5530 -0.0130	(g) measured at 31	3.03 302,33	% and we so	0.1
Sampling set up ensatile Tulk Sampler prototype#1 Tubes Auto desorbed by Markes Ultra (ECBC harcode C5491) attach Desorlied analyte was analyzed by Agrient 5890N gas chromatograph YFED was Meloy Labs Model PA 260 Analyzer (ECBC harcode 351  Experiment timing ant time contamination (time drap hirs substrate), and time contamination: art time data acquisition; end of varior experiment:  Additional informationity sight of substrate after evaporation: sidual mass of 'agent' after evaporation'  Extraction liquid straction liquid	(ECBC barcode C5206 58) - set at 10* 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 00 1728.5530 -0.0139	(g) measured at 31	3.03 302,33	% and we so	0.1
reflow relative humiday (Romane):  Sampling set up  Tersaule Tube Samplier prototype#1  Tubes Auto described by Markes Ultra (ECBC harcode C5491) attachy  Described analyte was analyzed by Appient 5899N gas chromatograph  [YFED was Meloy Labs Model PA 260 Analyzer (ECBC harcode 351  Experiment timing  ant time contamination (time drop hits substrate) and time data acquisition (desired wind velocity achieved), and time data acquisition; end of vapor experiment:  Additional informationship in substrate after evaporation;  engh of substrate after evaporation;  esidual mass of fagent after evaporation;  Extraction liquid  share experiment tiquid	(ECBC barcode C5206 58) - sej at 10" 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 09 1728.5530 -0.0139	(g) measured at 31	3.03 302,33	% and we so	0.1
en flow relative humiday (Romonic):  Sampling set up ersatile Tulk Sampling rotatorype#1 Tubes Auto desorbed by Markes Ultra (ECBC harcode C5491) attach Desorlied analyte was analyzed by Agrient 5899N gas chromatograph YFED was Meloy Labs Model PA 200 Analyzer (ECBC harcode 351  Experiment timing ant time contamination (time drop hits substrate), and time contamination: ant time contamination: Additional enquisition(desired wind velocity achieved), and time data nequisition; end of vapor experiment: Additional information eight of substrate after evaporation; sidual mass of agent after evaporation;	(ECBC barcode C5206 58) - sej at 10" 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 09 1728.5530 -0.0139	(g) measured at 31 is]	3.03 302,33	% and we so	0.1
er flow relative humiday (Romonic):  Sampling set up ersatile Tube Sampling prototype#1 Tubes Auto described by Markes Ultra (ECBC harcode C5491) attach Described analyte was analyzed by Appient 5890N gas chromatograph [YFED was Meloy Labs Model PA 260 Analyzer (ECBC harcode 351 Experiment timing ant time contamination (time drop hits substrate) and time contamination: ant time onto acquisition (desired wind velocity achieved). Inditine data acquisition end of vapor experiment:  Additional information eight of substrate after evaporation:  Extraction liquid straction liquid straction liquid straction liquid straction liquid covered mass.	(ECBC barcode C5206 58) - sei at 10**  08/18/05 14:54:49  08/18/05 14:57:42  08/18/05 20:00:02  93  1728.5530  -0.0139  NA  NA  NA  NA  NA	(g) measured at 31 is	3.03 302,33	% and we so	0.1
Extraction liquid struction liquid struc	(ECBC barcode C5206 58) - sei at 10**  08/18/05 14:54:49  08/18/05 14:57:42  08/18/05 20:00:02  93  1728.5530  -0.0139  NA  NA  NA  NA  NA	(g) measured at 31 ig) [att.] [att.] [att.] [att.] [att.]	3.03 302,33	% and we so	0.1
er flow relative humiday (Romonic):  Sampling set up ersatile Tube Sampling prototype#1 Tubes Auto described by Markes Ultra (ECBC harcode C5491) attach Described analyte was analyzed by Appient 5890N gas chromatograph [YFED was Meloy Labs Model PA 260 Analyzer (ECBC harcode 351 Experiment timing ant time contamination (time drop hits substrate) and time contamination: ant time onto acquisition (desired wind velocity achieved). Inditine data acquisition end of vapor experiment:  Additional information eight of substrate after evaporation:  Extraction liquid straction liquid straction liquid straction liquid straction liquid covered mass.	(ECBC barcode C5206 58) - sei at 10**  08/18/05 14:54:49  08/18/05 14:57:42  08/18/05 20:00:02  93  1728.5530  -0.0139  NA  NA  NA  NA  NA	(g) measured at 31 ig) [att.] [att.] [att.] [att.] [att.]	3.03 302,33	% and we so	0.1
in flow relative humidity (Roironic):  Sampling set up  Versaule Tube Sampler prototype#1  Tubes Auto desorbed by Markes Ultra (ECBC harcode C5491) attach  Desorlied analyte was analyzed by Agrien (5890N gas chromatograph  IYFED was Meloy Linbs Model PA 260 Analyzer (ECBC barcode 351  Experiment timing  tent time contamination (time drop hits substrate) and time contamination (time drop hits substrate) and time data acquisition (edsired wind velocity achieved), and time data nequisition; end of varior experiment:  Additional information  eight of substrate after evaporation; esidual mass of l'agent' after evaporation;  Extraction liquid  straction liquid  straction input diagrams activition in grand agent on extraction liquid  ecovered mass.	(ECBC barcode C5206 58) - sei at 10* 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02	(g) measured at 31 ig) [att.] [att.] [att.] [att.] [att.]	3.03 302,33	% and we so	0.1
ir flow relative humidity (Romane):  Sampling set up  Fersaule Tube Sampler prototype#1  Tubes Auto desorbed by Markes Ultra (ECBC harcode C5491) attach  Desorlied analyte was analyzed by Apriem 5899N gas chromatograph  [YFED was Meloy Linbs Model PA 260 Analyzer (ECBC barcode 351)  Experiment timing  tant time contamination:  tant time data acquisition/desired wind velocity achieved), and time data acquisition/desired wind velocity achieved), and time data acquisition-end of varor experiment:  Additional information  reight of substante after evaporation:  Extraction liquid  straction liquid  straction liquid  covered mass:  Lixed nutematic defect	(ECBC barcode C5206 58) - sei at 10* 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02	(g) measured at 31 is) [att.] [att.] [att.] [att.] [att.]	3.03 302,33	% and we so	0.1
in flow relative humidity (Romane):  Sampling set up  Described Tube Sampler prototype#1  Tubes Auto described by Markes Ultra (ECBC harcode C5491) attach  Described analyte was analyzed by Agrient \$890N gas chromatograph  [YFED was Meloy Linbs Model PA 260 Analyzer (ECBC barcode 351  Experiment timing  tant time contamination (time drop hits substrate).  Ind time data acquisition/desired wind velocity achieved).  Ind time data acquisition-end of varior experiment:  Additional information  english of substrate after evaporation:  estimal mass of 'agent' after evaporation.  Extraction liquid  straction liquid  straction liquid  covered mass:  Lixed nuternatic defect	(ECBC barcode C5206 58) - sei at 10* 08/18/05 14:54:49 08/18/05 14:57:42 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02 08/18/05 20:00:02	(g) measured at 31 is) [att.] [att.] [att.] [att.] [att.]	3.03 302,33	% and we so	0.1



## Data sheet droplet evaporation in ECBC Tunnel 3a

## If the semperature   \$0,2 °C   0.2 ## All burg Flewmeter air flow rate   18.14 \$1.PM   0.1 ## Transition section will temp (crose)   55.0 °C   0.1 ## Fransition section will temp (front)   55.0 °C   0.1 ## Substrate Temperature   50.5 °C   0.1 ## Substrate Temperature (Piston)   54.9 °C   0.1 ## Piston zone temperature (Piston)   50.0 °C   0.1 ## Piston zone temperature (Pist	DATE:	22-Aug-ZiXIS				
ABPLIEW FILENAME   DRI SOCCHT unnerGat 2000;000000000000000000000000000000000	ECBC FILESERVERNAME:	rgnckol on 'Filesyr'	(H:)\Spartan\Glass\B	tins\2	0050822_3	Su_53.xis
Substrate   Subs	ABVIEW FILENAME				_	
Substrate   Subs				1.01.00		
Separate sample size   Agent					1	
Agent   Agen	ype of substrate .	Glass	valley design, 1.45°	- wasi	J ied accord	ing to Protice
See   Inquired   Inq	ubstrate sample size					
	Agent				]	
1,27 mg/st   1,2	esi liquid.	(II)			•	
Contamination						
1			nominal density is	1111711	1,2	7 mg/st.
A command drop volume   S. 5.26 pt   S. 5					•	
1858.342   Img						
1558.342   Img			•			
Name   1865, 487						
Table   Tabl						
Contracted space on 103% agent purity						
CONTROL PARAMETERS   set up   setual mean value   Units   \$ stdev	orrected mass on 103% agent purity	6.959	Img] of 100% Agent			
CONTROL PARAMETERS						
Miller Netson Temperature   49,4 °C   0,					,	
Solution		S set ap	actual mesa va			
Authorig Flewmeter air flow rate   18,14 SLPM   0,					-	0,1
Transition section will temp (cone)   55.0 °C   6.0						0.2
Section wall temp (Front)   S.5.0 °C   0.0						0.3
Substrate Temperature   50.5 °C   0,1	runsition section will temp. (cooc)			55.0	°C	0.1
Sampling set up   S4.9 °C   Oxionscipes section will temp.   S0.0 °C   Oxionscine box wall temp.   Oxionsc	cich section wall temp.(Iront)			\$5.0	°C'	0.0
100   100	abstruic Temperature			50,5	°C.	0.7
Sampling duct wall temp.   S0.0 °C   0.2	iston zone temperature (Piston)			54.9	°C	0.8
sampling duct wall temp (Veni)?  and servine at flow speed  as servine at flow speed  as flow relative humidity (Rounnic).  Sampling set up  Versatife Tube Sampler prototype#1  [Tubes Auto desorbed by Markes Ulara (ECISC bitrode C5491) attached to MarkesUnity desorber (ECBC barcode C5492) and air server (ECBC besorbed analyte was analyzed by Agricut. 5890N gas chromatograph (ECBC barcode C5206) with FPD)  4YFED was Meloy Lobs Model PA 260 Analyzer (ECBC barcode 15158) set at 10.  Experiment timing  start time contamination.  Experiment timing  start time contamination.  88/22/05 10:58:50  end time data acquisition-leasined wand velocity achieved)  and fine data acquisition-end of vapor experiment.  88/22/05 11:02:55  4.08 minutes  and fine data acquisition-end of vapor experiment.  88/22/05 15:00:00  237,08 minutes  weight of substrate after evaporation:  -0.0020 [g]  Extraction figuid  extraction figuid  NA  [nui]  concentration of agent is extraction liquid:  NA [nuii]  concentration of agent is extraction liquid:  NA [nuii]	ost-test section wall temp.			50.0	*C	0.1
Sampling set up  Versatile Tube Sampler prototype#1  Trubes Auto desorbed by Markes Ultra (ECISC bircode C5491) intached to MarkesUnity desorber (ECISC barcode C5492) and air server (ECISC bircode C5491) and bircode C5206) with FPD)  4YFED was Moley Leas analyzed by Agricus 5800N gas chromatograph (ECISC bircode C5206) with FPD)  4YFED was Moley Leas Model PA 260 Analyzer (ECISC barcode 15158) set at 10 b  Experiment timing  start time contamination (time drop hits substrate)  and time contamination (time drop hits substrate)  and time data acquisition-desired wind velocity achieved)  and time data acquisition-end of vapor experiment;  BR/22/05 15:00:00  Additional information  (a) (22/05 15:00:00  1858.3400 [g] measured at [1 am on 8/23/2005 residual mass of "agent" after evaporation:  Extraction liquid  Extraction figuid  NA [ini]  concentration of agent is extraction liquid:  NA [inin]  concentration of agent is extraction liquid:  NA [inin]	nexing box wall temp.			50.6	°C	0.1
Sampling set up	ampling duct will temp (Veni)?			50.0	°C	G.
Sampling set up	est section air flow speed			0.24	mu/s	0.0
Versatile Tube Sampler prototype#	ir flaw relative humidity (Roconic).			2.36	%	0.1
Versitife Tube Sampler prototype#1  Tubes Auto described by Markes Ultra (ECISC bircode C5491) intached to MarkesUnity describer (ECBC barcode C5492) and air server (ECBC becode C5206) with FPD)  4YFED was Auto described analyte was analyzed by Agrient 5890N gas chromatograph (ECBC beroode C5206) with FPD)  4YFED was Alchoy Lobs Model PA 260 Analyzer (ECBC barcode 15158) set at 10 <sup>th</sup> Experiment timing  that time contamination (time drop bits substrate)  end time contamination (time drop bits substrate)  that time data acquisitron-desired wind velocity achieved)  ond time data acquisitron-end of vapor experiment.  UR/22/05 15:00:00  237,08 minutes  Additional information  veight of substrate after evaporation:						
Tubes Auto described by Markes Ultra (ECISC bircode C5491) into hed to MarkesUnity describer (ECBC barcode C5492) and air server (ECBC Described analyse was snalyzed by Agricin. 5890N gas chromatograph (ECBC barcode C5206) with FPD)  19						
200   200	Desorbed analyte was analyzed by Agrient 5890N gas chromatograph IYFED was Meloy Lobs Model PA 260 Analyzer (ECBC barcode 151	(ECBC burcode C520) 158) set at 10 <sup>6</sup>		C5492	t) and hit so	erver (ECBC b
State conditions data acquisition desired wind velocity achieved.   OB/22/05 11:02:55   4.08 minutes	tart time contamination (time deep hits substrate):	08/22/05 10:58:50			•	
end time data acquisition- end of vapor experiment: U8/22/05 15:00:00 237,08 institutes  Additional information  Veright of substrate after evaporation: 1858,3400 [g] measured at [1 am en 8/23/2005 -0.0020 [g]]  Extraction higher exhibition of agent in extraction liquid: NA [min] concentration of agent in extraction liquid: NA [min]	nd time contamination.					
Additional information  Additional information  1858.3400 [g] measured at [1 am on 8/23/2005 on 0.0020 [g]    Extraction liquid  Extraction liquid  NA [nti]  Extraction time (ultrasonicate)  NA [nti]  Concentration of agent is extraction liquid:  NA [nti]		08/22/05 11:02:55		4.08	minutes	
1858.3400   g   measured at [1 am cn 8/23/2005   estimation figured   content of the content o			2	37,08	minutes	****
1,0020 [g]					22.02.2.2	
extraction figured NA [mil] reduine extraction liquid: NA [mil] extraction time: (ultrasonicate) NA [min] concentration of agent is extraction liquid: NA [µg/mt]				1 pn 8/	2372005	
voluine extraction liquid: [not] , extraction time: (ultrasonicate) NA [min] , concentration of agent in extraction liquid: NA [µg/mt]	Extraction bound					
extraction time: (ultrasonicate) NA [min] concentration of agent is extraction liquid: NA [µg/mt]	Carractions of aut	A1.0				
concentration of agent is extraction liquid: NA [µg/ml]	struction figured	,				
	struction fiquid. Olyme extraction tiquid.	NA				
	struction figuid oluine extraction liquid struction time (ultrasonicate)	NA NA	[min]			
recovered mass: NA [mg]  Used automatic detectors	straction figure oldine extraction liquid struction time (ultrasonicate) oncontration of agent in extraction liquid	NA NA NA	[min] [µg/ml]			

Remarks
Drop deposited with VWR microdispenser by KBS, uniform spread video data was recorded

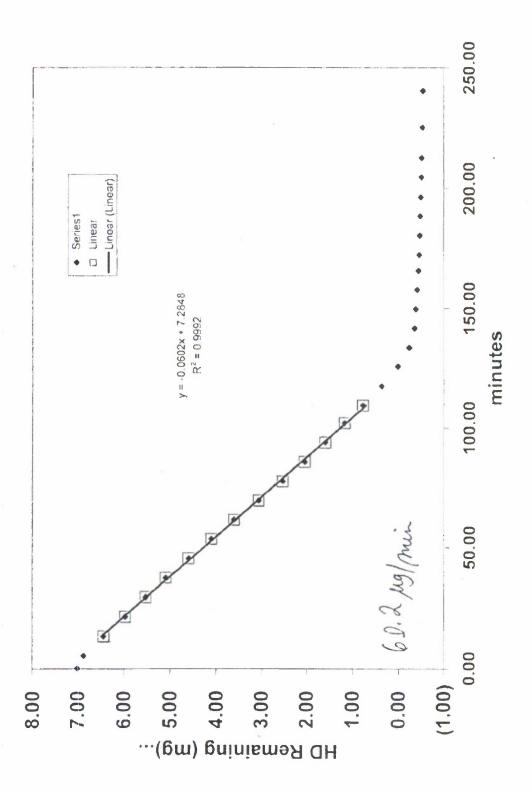


## Data sheet droplet evaporation in ECBC Tunnel 3a

	23-Aug-2005				
ECBC FILESERVERNAME:	rguckal on 'Filesyr'(H	:)\Spartan\GlossRun	1200	50822_3a_	54.sis
LABVIEW FILENAME	B5150(Cf/Tunnelt3a\2	005\20050822 Ja 54.	a la		
EXP. Nu.:	854				
Substrate					
ype of substrate :		valley design, 1.45" -	wash	eel peçord	ing to protoc
ubstrate sample size	36.6mm diameter		1052		B
Agent					
est liquid	110				
igen] neal / thickened	nent				
gent purity		monimal density is		1.2	7 mg/sil,
Contaminat					
number of draps:	1				
nominal drop volume actual calculated drop volume	5,667	μ1. 1			
weight of clean substrate	1810.848				
weight of continuinated substrate:	1818.045				
mass of agont dissominated	7.197				
conceted mass on 100% agent purity		hig of 190% Agent			
cital contamination density		[g/m <sup>2</sup> ]			
creal contempation density reculoulated on 100% agent purity;		[g/in]			
CONTROL PARAMETE	ERS set up	actual mean valu	e	Units	± stdev
filler Nelson Temperature			49,4		0.1
is their temperature,			50.0		0.2
calberg Flowmeter air flow rate				SLPM	0.1
ransmun section wall temp. (cone)			55.0		0.1
rich section wall temp (from)			55.0		0,6
obstrate Temperature			51.0		0.5
istent zone temperature (Piston)			54.9	-	6.5
usidest section wall temp.			50,0		0.0
sixing box wall temp.			541.2	-	0.4
ampling that wall temp (Vont)?			50,0		0.0 0.0
est section air Bow speed; ir flow relative hymidis (Rotionic).			1,63		9.6
I the truber damen's freedows?				74	12.4
Sampling set	ыņ				
Versattle Tube Sampler prototype#1.					
Tubes Auto described by Markes Ultra (ECBC barcode C5491) atta			192) :	and uir serv	er (ECBC bar
Described analyte was analyzed by Agriem 5890N gas differenting [YEED was Melvy Labs Model PA 260 Analyzer (ECBC barcode 3		with FPD)			
	and the second second				
Experiment tim					
arl time contamination (time drop hits substrate);	8/23/2005 10:49:00				
nd tone contamination.	8/23/2005 10:52:32		3 **		
art ture data acquisition(desired wind velocity achieved): nd time data acquisition- end of vapor experiment:	B/23/2005 10:52:32 B/23/2005 16:59:57	2.		minutes minutes	
Additional inform		31	1.42	107 C 11 C 15	-
eight of substrate after evaporation		(g) measured at			
	-0,6070	gl			
	p id				
andual mass of "agent" after evaporation.  Extraction Equ	NA NA				
andual mass of "agent" after evaporation:  Extraction liquid	NA NA	[ml]			
eadual mass of "apost" after evaporation:  Extraction liquid plane extraction liquid straction time. (attrasmicate)	NA NA NA	[mil] [mill]			
endual mass of "appent" after evaporation:  Extraction liquid plane extraction liquid; struction liquid; struction liquid; struction lime (attrasparies); succentration of agent in extraction liquid.	NA NA NA NA	[min] [#p/m1]			
Extraction liquid  Extraction liquid  glique extraction figuid  struction time (attrasmicate)  occumentors of agent in extraction liquid  concentration of agent in extraction liquid  occurred mans.	NA NA NA NA NA	[min]		1	
endual mass of "appent" after evaporation:  Extraction liquid plane extraction liquid; struction liquid; struction liquid; struction lime (attrasparies); succentration of agent in extraction liquid.	NA NA NA NA NA	[min] [#p/m1]		I	
Extraction liquid  Straction liquid  Straction liquid  Straction liquid  Straction floard  Straction floard  Straction floard  Straction floard  Straction for (attraction liquid  accontation of agent in extraction liquid  accontation of agent in extraction liquid  Convered mass.  Used nationatic de	NA NA NA NA NA	[min] [#p/m1]		l.	
Extraction liquid  Extraction liquid  glique extraction figuid  struction time (attrasmicate)  occumentors of agent in extraction liquid  concentration of agent in extraction liquid  occurred mans.	NA NA NA NA NA	[min] [#p/m1]		 	

Remarks

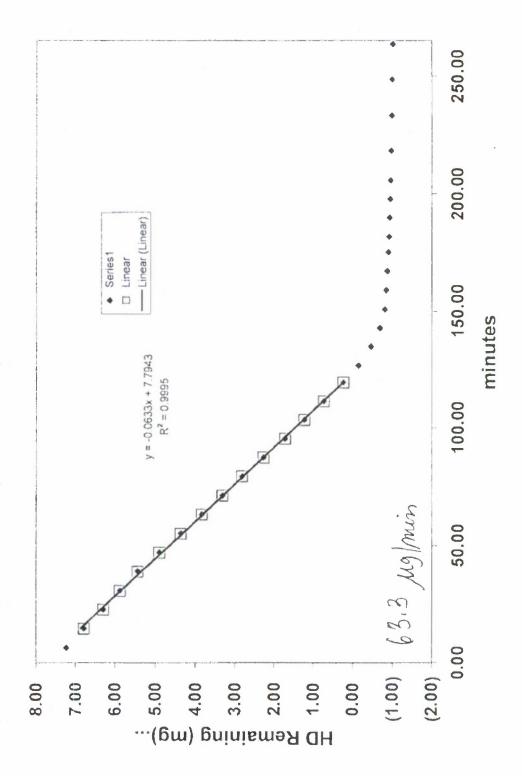
Drop was deposited by KBS using VWR microdispenser - uniform spreading observed Video data was received.



## Data sheet droptet evaporation in ECBC Tunnel 3a

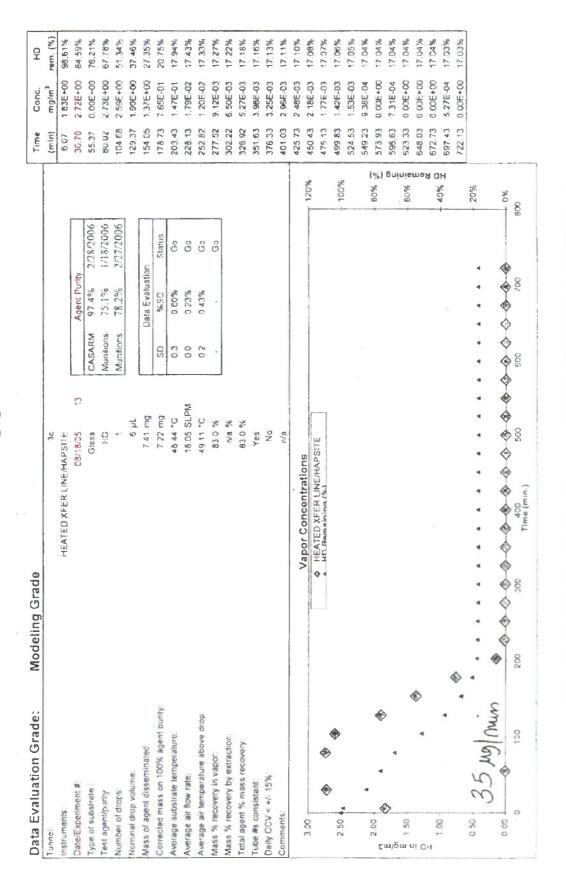
	25-A #g-2005			
ECBC FILESERVERNAME:	rgackat on 'Filesyr'()I.	) Sparton/Glass/Runs/200	50825_3u	56.ah
LARVIEW FILENAME	H5150/C/(Tunnef/3a/2)	105/20050825_3a_56.xb		
EXP. No.;	556			
Substra	ile		1	
ype of substrate	Glass	valley design, 1.45" - wast	a wil arcord	ling In producul
obstrate nample size	36.6mm diameter	0,001052	131	
Agen				
est Equiti:	IID			
gerif near / thickened:	next or and	nominal density is		27 mulut
geni purity Contamin		demand of deal list of the contract	· · · · ·	27 mg/st.
uniter of crops	31190		Į.	
uminal dree volume	•	μL		
ichail calculated drop volume	5.991			
wight of clean substrate.	1838.639			
veight of contaminated substitte	1838,248			
nass of agent disterninged.	7.609			
orrested mass on 100% agent purity ictual contamination density		[mg] of 100% Agent		
ctual contilmination density reculciblined on 300% alignt parity.		2/m		
CONTROL PARAME		actual mean value	linite	± stdes
fille: Nelson Temperature		49.3	eC.	0.1
ii flow temperature		50,1	*C	0.2
alborg Flownister air flow rate			SLPM	0.0
tinsition section wall temp (cone)		55.0		0,1
eich section with temp (frint) phistrate Temperature		55.0 51.2		0.0 0.6
iston zione temperature (Piston)		54.9		0.8
ist-sest section wall temp		50.0	**	0.1
grang box wall temp		50.3		0.4
impling duct wall temp (Vent)		50,0	*C	
st section air flow speed		D.25		0.0
(Romonelative humidity (Romonic):		1,63	15%	U.4
Sampling 6	et up			
ersotile Tube Sampler pritintype#1				
Tubes Auto described by Markes Ulira (ECBC bareade C5-191) a			ind air serv	rer (ECGC bare
besirched analyte was analyzed by Agalent \$890N gas chromato;	graph (ECBC baroode C5206) i	with PPD:		
	. 251694			
	e 35158)	,		
YFED was Meley Labs Model PA 260 Analyzer (ÉCBC bareod Experiment	teming		]	
PFED was Meloy Labs Model PA 200 Analyzer (ECBC bareod  Experiment act time contamination (time Jrop bits substrate)			)	
YFED was Melay Labs Model PA 260 Analyzer (ECBC baread Experiment act time contamination (time drop bits substrate) act time contamination.	6ming 8/25/2005 11:17:30		) minutes	
YFEO was Meloy Labs Model PA 260 Analyzer (ECBC bareod Laperiment and time contamination (time drop hits substrate) ad time contamination (time drop hits substrate) and time data acquisition (resulting data acquisition) results wind vehicity achieved).	teming	4.75	minutes minutes	
YFEO was Melay Labs Model PA 260 Analyzer (ECBC bareod Laperiment an time contamination (time drop hits substrate) and time contamination (time drop hits substrate) art time data acquisition (residual wind vehicity achieved).	8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55	4.75		
YFEO was Melay Labs Model PA 260 Analyzer (ECBC beread Laperinten) and time contamination (time drop hits substrate) ad time contamination (time drop hits substrate) and time data acquisition end of vapor experiment.  Additional inforciple of substrate after evaporation	6ming 8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55 PRINTING 11:30:6480	4.75 337.67 [g] measured at 2pm 8/29/2	minutes	_
YFED was Muley Labs Model PA 260 Analyzer (ECBC berook  Ixperiment of time contomination (time drop hits substrate)  at time contomination (time drop hits substrate)  at time data acquisitron/restred wind velocity achieved)  disme data acquisitron-end of vapor experiment.  Additional info  ciplin of substrate after evaporation  sidual mass of "agent" after evaporation:	8/25/2005 11:17:30 8/25/2005 11:27:30 8/25/2005 12:22:15 8/25/2005 16:59:55 prosition 1830,6480 1,0090	4.75 337.67 [g] measured at 2pm 8/29/2	minutes	_
YFED was Meloy Labs Model PA 260 Analyzer (ECBC bareod Experiment and time apartementation (time drop bits substrate) addition contamination and time data acquisition/resided wind velocity achieved) addition data acquisitions end of vapor experiment Additional infection of substrate after evaporation sidual mass of "agent" after evaporation.  Extraction I	6ming 8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55 9conation 1830.6480 (0.000)	4.75 337.67 [g] measured at 2pm 8/29/2	minutes	_
YFED was Meloy Labs Model PA 200 Analyzer (ECBC berook  Experiment and time contamination (time drop bits substrate) and time contamination and time data acquisition(resided wind vehicity achieved) ad time data acquisition-end of vapor experiment  Additional infection of substrate after evaporation  Extraction I grad-	6ming 8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55 prosition 1830.6480 (0.009)	4.75 337,67 [g] measured at 2pm 8/29/2 [g]	minutes	-
YFEO was Meloy Labs Model PA 260 Analyzer (ECBC beread Experiment and time opinionization (time drop bits substrate) will time contamination (time drop bits substrate) will time data acquisition/resired wind velocity achieved) and time data acquisition-end of vapor experiment Additional information of substrate after evaporation sidual mass of Tagent after evaporation:  Extraction I procedure liquid	6ming 8/25/2005 11:17:30 8/25/2005 11:27:30 8/25/2005 11:22:15 8/25/2005 16:59:55 Entities 18/30:6480 (1,0090 NA NA	4.75 337.67 [g] measured at 2pm 8/29/2	minutes	-
YFED was Melay Labs Model PA 260 Analyzer (ECBC bareod  Experiment ant time contamination (time drop bits substrate) all time contamination (time drop bits substrate) all time data acquisition/resired wind velocity achieved) at time data acquisition-end of vapor experiment.  Additional infectiglion (substrate after evaporation:  Extraction I struction liquid estrection fine (ultrasonicate) acceptation of agent in extraction liquid	6ming 8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55 9FRESTION 1830.6480 (1,009) injurid NA NA NA NA NA NA NA NA NA	4.75 337,67 [g] measured at 2pm 8/29/2 [g]	minutes	_
Experiment  art time contamination (time drop bits substrate) and time contamination (time drop bits substrate) and time contamination and time data acquisition-end of varior experiment  Additional infe eight of substrate after evaporation  sidual mass of "agent" after evaporation:  Extraction I guid  proceduration (idual- discrete after of procedure experiment)  exercise liquid  proceduration (idual- discrete after evaporation injud- dendered time (idual- discrete after experiment)  proceduration of agent in extraction liquid  ecovered mass.	6ming 8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55 570:2109 1830.6480 (1,009) iquid NA NA NA NA NA NA NA	4.75 337.67 [g] measured at 2pm &/29/2 [e] [mt] [mt]	minutes	
Figure 1 (ECBC barook  Experiment in time contamination (time drop bits substrate) at time contamination (time drop bits substrate) at time data acquisitions and of super experiment.  Additional information after evaporation:  Extraction I draw extraction liquid intended by the extraction of agent in extraction liquid intended by the extraction of agent in extraction liquid intended by the extraction of agent in extraction liquid intended by the extraction of agent in extraction liquid intended by the extraction of agent in extraction liquid.	6ming 8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55 570:2109 1830.6480 (1,009) iquid NA NA NA NA NA NA NA	4.75 337.67 [g] measured at 2pm &/29/2 [g] [mtt] [mtc] [ntc]	minutes	
YFEO was Meloy Labs Model PA 260 Analyzer (ECBC berood  Experiment and time contamination (time drop bits substrate) all time contamination (time drop bits substrate) all time data acquisition/resired wind velocity achieved) at time data acquisition-end of variar experiment.  Additional infe eight of substrate after evaporation:  Extraction I conceived liquid dimere extraction liquid covered mass.	6ming 8/25/2005 11:17:30 8/25/2005 11:22:15 8/25/2005 16:59:55 570:2109 1830.6480 (1,009) iquid NA NA NA NA NA NA NA	4.75 337.67 [g] measured at 2pm &/29/2 [g] [mtt] [mtc] [ntc]	minutes	_

Remarks
First time the autosampler is tun without BK being on hand. AF and RGN landle the duties.
KBS deposits drop using VWR autosampler set at 6.35. Slight inovement of privite during deposition, due was freshly channed, whereas most others are pre-cleaned.

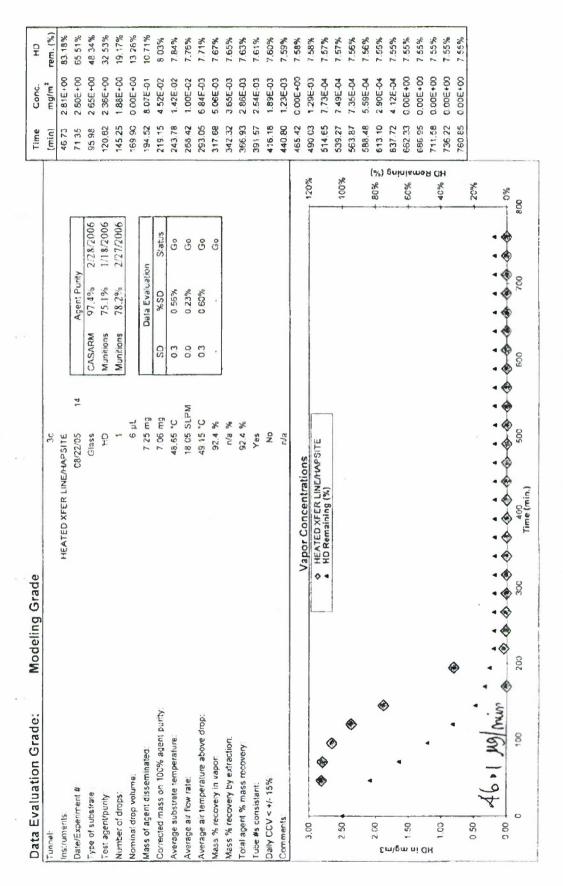


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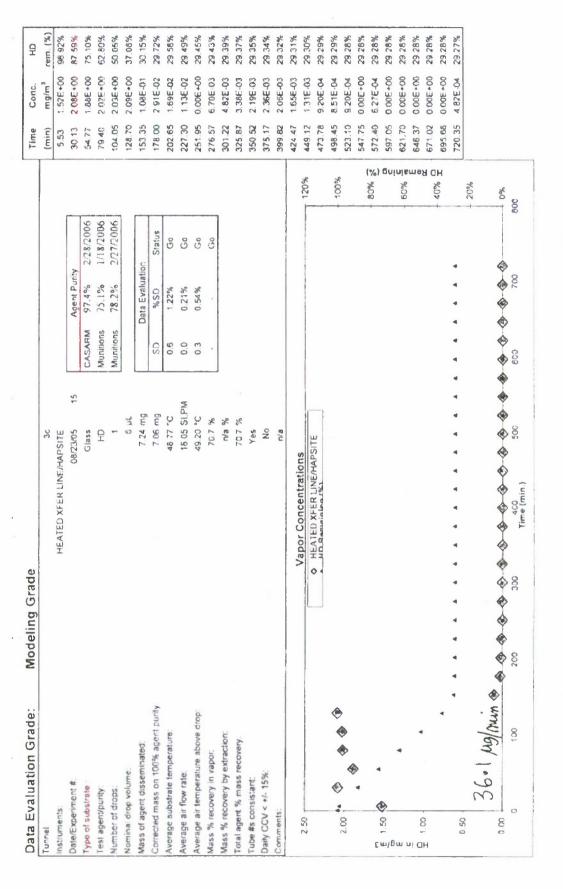
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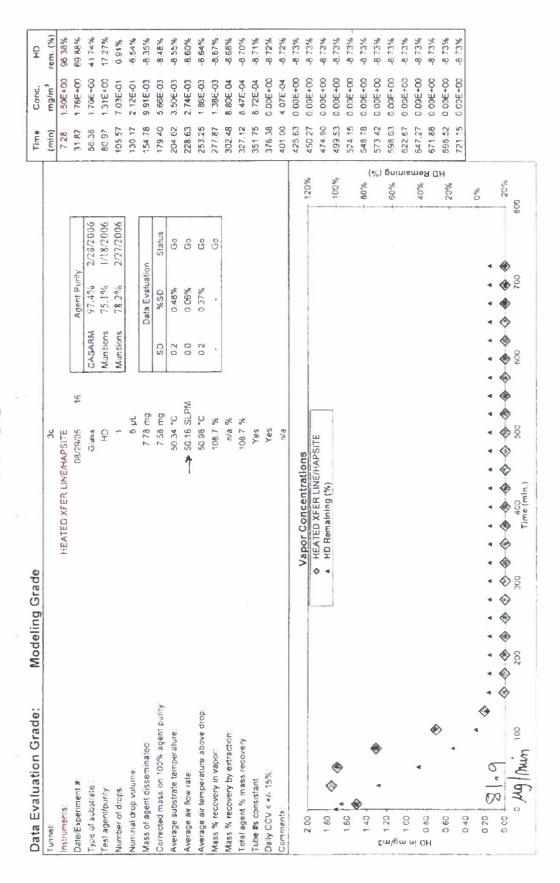


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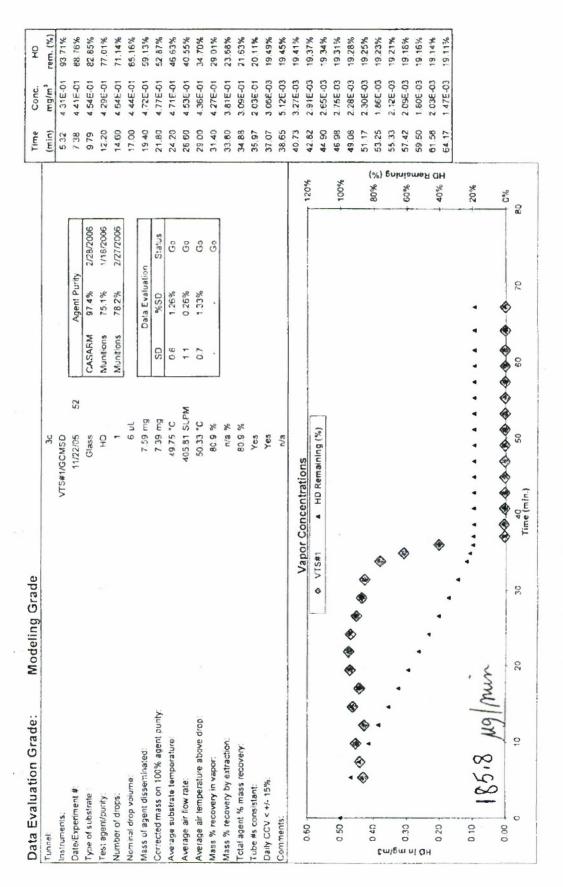
20050824\_3a\_55

Data Evaluation Grade:		Modeling Grade							Time	Conc.	무
Tunnel.			38						(min)	mg/m³	rem. (%)
Instruments			VTS#1/GCMSD						4.33	1.20E+00	99.36%
Date/Experiment #;			08/24/05	- 55	innonna d	Agent Purity	,		9.88	1,20E+00	97.72%
Type of substrate			(Slass		CASARM	97.4%	2/28/2006		15.45	1.68E+00	95.75%
Test agent/purity.			HD		Munitions	75.1%	1/18/2006		50.38	2.12E+00	79.43%
Number of drops:					Munitions	78.2%	2/27/2006		55.93	2.56E+00	76.24%
Naminal drop volume:			9 tr	7					61.50	2.01E+00	73.11%
Mass of agent disseminated			7.58 mg	Ĉ.	0	Data Evaluation	on		67.08	2.30E+00	70.15%
Corrected mass on 100% agent purity	ent purity		7.39 mg	- Bu	QS	GS%	Status		72.65	2.02E+50	67.19%
Average substrate temperature	re:		51.11 °C	0	1.0	1.91%	ල		78.25	2.30E+00	64.22%
Average air flow rate:			18.14 SLPM	SLPM	0.3	168%	S		83.85	2.06€+00	61 23%
Average air femperature above drop.	ve drap:		50.20 °C	0	0.2	0.41%	°° S		88.45	2.24E+00	58.27%
Mass % recovery in vapor:			60.2 %	*	н	٠	Go		95.05	2.02E+00	55.34%
Mass % recovery by extraction:	30:		2 m/a %	%					100.65	2.25E+00	52.41%
Total agent % mass recovery.	2.0		60.2 %	*					106.25	1.99€+00	49.49%
Tube #s consistant.			Yes						111.87	2.20E+00	%09.97
Daily CCV < +/- 15%:			Yes						118.22	4.91E-01	44.50%
Comments			n/a						123.80	5.37E-01	43.80%
		677	Vanor Concontrations						129.42	4.70E-01	43.10%
3.00	Minima de la compansa del compansa de la compansa de la compansa del compansa de la compansa de	1		100		THE RESERVE THE PERSON NAMED IN		120%	135.03	5.04E-01	42.43%
	9	100	VISHINGCMSD A HU Kemaining (%)	(%)					140,62	4.59E-01	41.77%
2.50	•							100%	146.22	4,66E-01	41.14%
•	*	*							151.80	4.03E-01	40.54%
6	* * *								158.92	1.08E-01	40.09%
2.00		<b>⊕</b>						%)	164.53	8.05E-02	39.96%
<b>⊗</b>								Buj	170.13	2.59E-02	39.89%
1.50	•							+ 60% in	175.72	2.01E-02	39.86%
2								mes	183.83	3.84E-03	39.83%
1 100		:						10	189.45	4.67E-03	39.83%
200									195.03	2.40E-03	39.82%
		•							200.65	2.58E-03	39.82%
0.50			***					+ 20%			
	J( . 6 Mg/mm		(A)						,		
1							***	%0 +			
0	20	100	150 Time (min.)	200		250	,	300			
To the first of th		The first management of the second se					TATAL OF THE SECOND SEC				

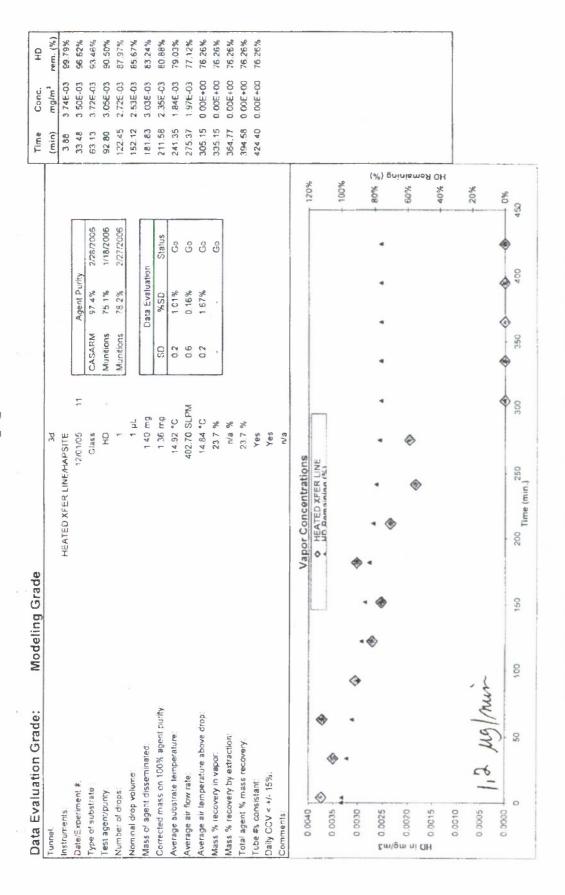
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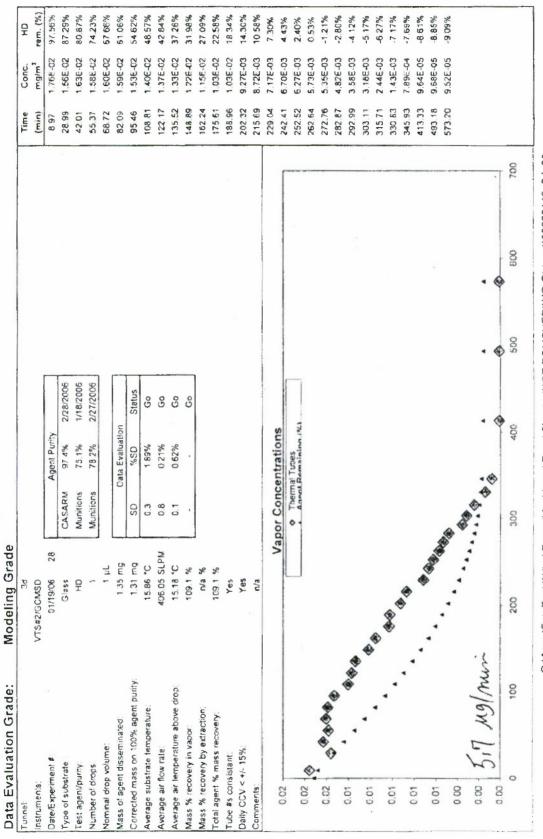
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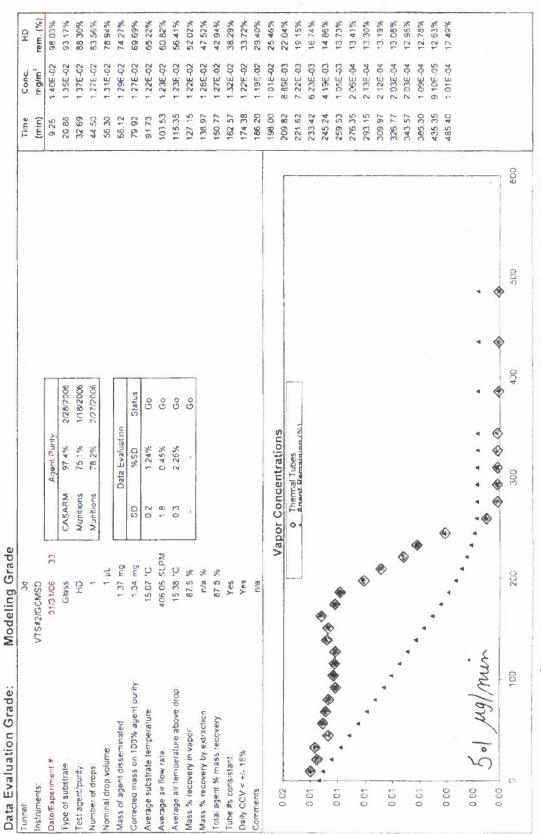
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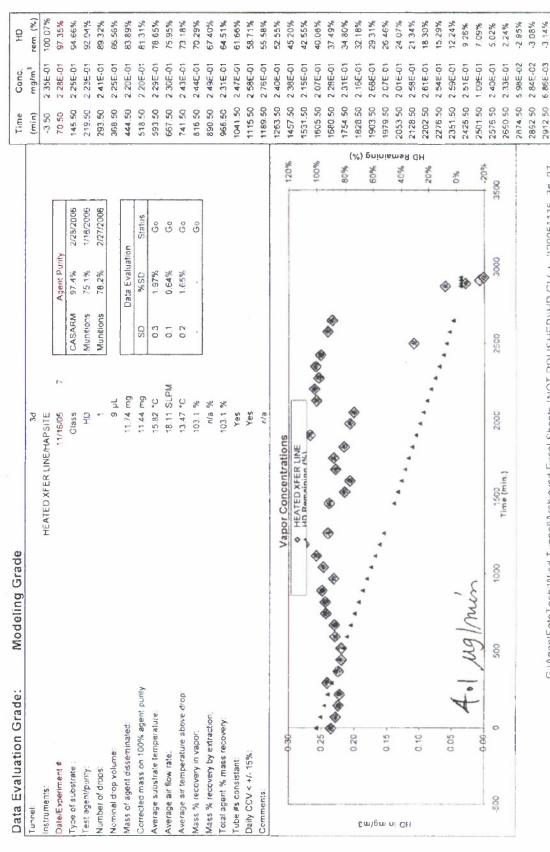
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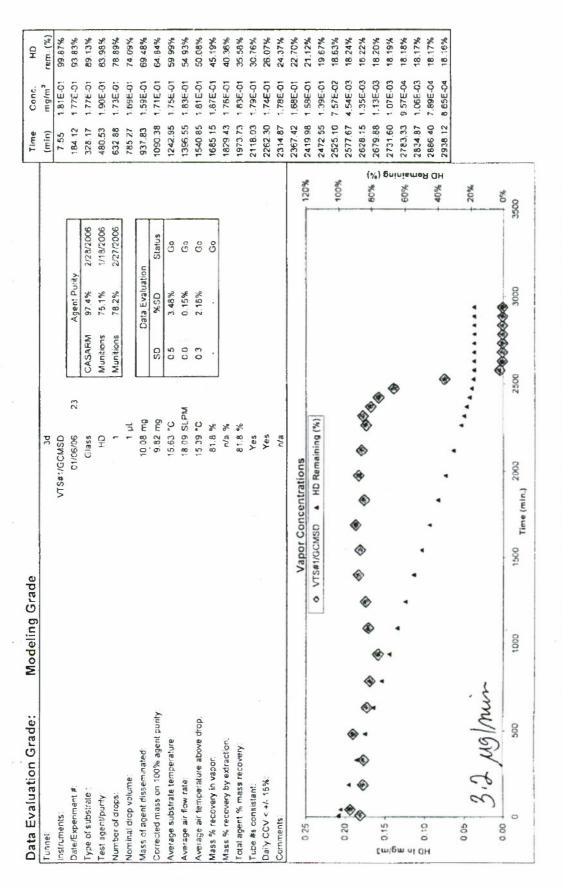
84.90% 78.79% 36.45% 30.49% 24.98% 72.66% 66.22% 59 78% 53.92% 48.11% 42.21% 20.29% 12.39% -2.43% 97.32% %96.06 16.11% 9.03% 6.03% 3 48% -0.21% -2.11% -2.58% -2.68% -2.79% -2.85% 1.43% -1.40% 1,31E-04 4.14E-03 1.95E-02 1.76E-02 1.29E-02 1.02E-02 S 24E-03 5.33E-03 2.73E-03 1.39E-03 2.02E-04 2.006-04 .77E-02 1.796-02 94E-02 1.79E-02 1.60E-02 1.77E-02 1.64E-02 1.69E-02 1.76E-02 1.42E-02 1.13E-02 8.15E-03 6.56E-03 4.58E-04 1.82E-04 174E-02 2.05E-04 130.62 141.70 163.85 186.00 197.08 219.23 230.32 241.38 252.47 263.55 294.20 327.69 108.47 119.55 152.77 174.93 208.17 75 23 86.32 277.45 310.94 42.02 97.38 19.87 30.93 53.08 64.17 8 80 1/18/2006 2127/2006 2/28/2006 Status 9 000 250 Data Evaluation Vapor Concentrations Agent Purity 97.4% 75.1% 78 2% OS% 0.81% 0.15% 0.49% 200 CASARM Murritions Munitions CS 0.6 0.1 0.1 150 Modeling Grade 406 08 SLPNF 1.30 mg 177 1.34 mg 14.69 °C 15.03 °C 103.1 % 103.1 % nya % Yes VTS#2/GCMSD 02/02/06 Glass 무 100 Corrected mass on 100% agent purity Data Evaluation Grade: Average air temperature above drop: S Average substrate terriperature. Mass % recovery by extraction: Total agent % mass recovery. Wass of agent disseminated. Mass % recovery in vapor. Nominal drop volume. Average air flow rate: Daily CCV < +/- 15% Tube #s consistant: Date/Experiment # Type of substrate Number of drops: Test agent/purity: 0.03 0.02 0 00 0.01 000 Comments 0.01

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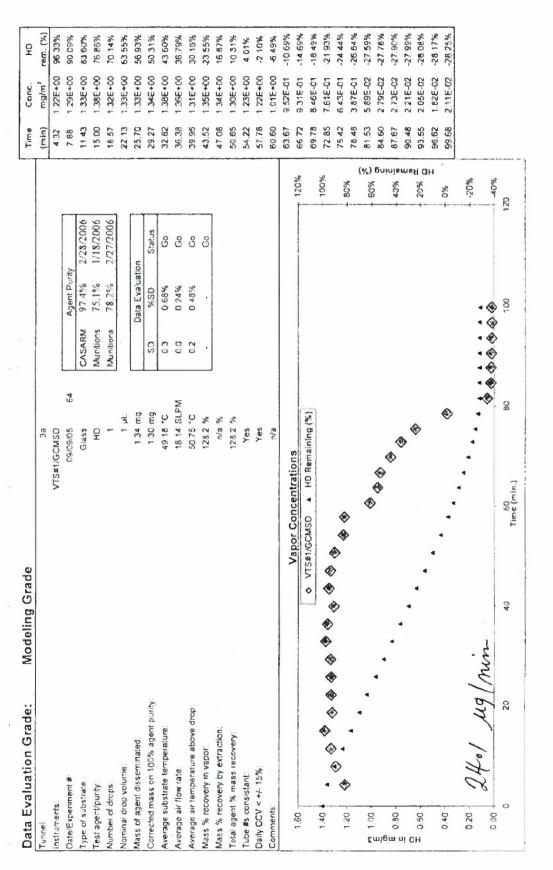
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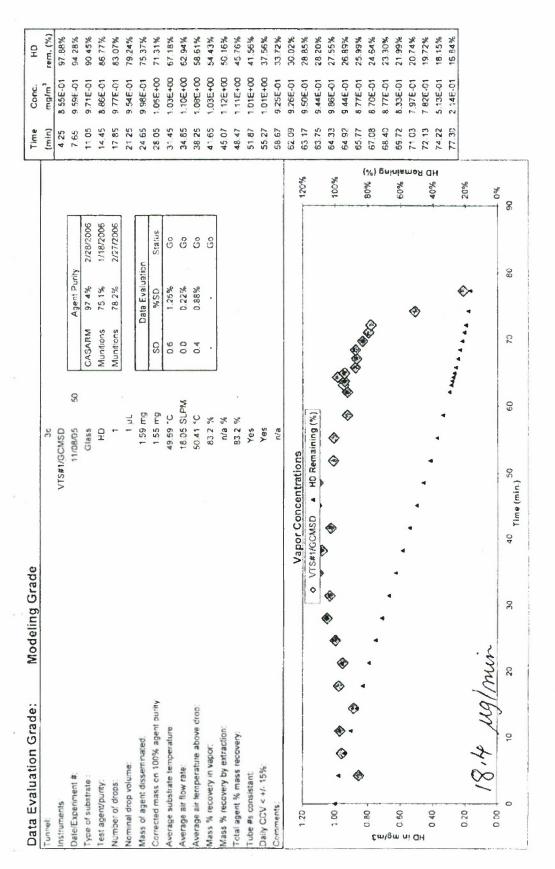
Tunnel				4		201111111111111111111111111111111111111		2
and the state of t	38					(min)	mg/m	rem. (%)
	VTS#2/SCMSD					3.87	1.06E+00	96 80%
Date/Experiment #.	09/20/05 61		Agent Purity	Α.		7.42	1.17E+00	90.63%
Type of substrate	Glass	CASARM	97.4%	2/28/2006		10.98	1,24E+00	83.92%
Test agentipunty	GH CH	Munitions	75.1%	1/18/2006		14.55	1.345+00	76 72%
Number of draps.	*	Munitions	78.2%	2/27/2006		18.12	1.15E+00	59 82%
Nominal drop volume:	13					21.68	1.178+00	63.40%
Mass of agent disseminated	1.19 mg		Data Evaluation	ion		25.25	1.27E+00	56.61%
Corrected mass on 100% agent purity:	1.16 mg	SD	%20	Status		28.82	1.22E+00	<b>%59.65</b>
Average substrate femperature:	49.09 °C	0.6	1.19%	Go		32.37	1,34E+00	42.60%
Average air flow rate:	18.14 SLPM	7.0	2.42%	Co		35.93	9.95E-01	36.10%
Average air temperature above drop:	45.42 °C	0.5	0.43%	09		39.50	5.37E+00	18.42%
Mass % recovery in vapor:	1380 %	1		Flag		43.07	1.40E+00	-0.37%
Mass % recovery by extraction:	1/a %					45.63	1.42E+00	-8.20%
Total agent % mass recovery.	138 0 %					50.20	1.02E+00	-14,97%
Tube #s consistant:	Yes					53.77	1.03E+00	-20.64%
Daily CCV < +/- 15%:	Yes					56.58	6.605-01	-24.34%
Comments	e/u					59.65	8.08E-01	-27.85%
						62.70	7.45E-01	.31.54%
The second secon	2	To proceed the second s			120%	65.77	6.31E-01	-34.83%
<b>*</b>	VTS#2/GCMSD A HD Remaining (%)				900	68.83	3.51E-01	-37.17%
300 40					8	71.90	0.00E+00	38 01%
4					+ 80%	74.47	0.00E+00	-38.01%
						77.52	0.00E+00	-38.01%
4					%)	80.58	0.00E+00	-38.01%
m/g					40% Prii	83.65	0.00€+00	-38.01%
300						86.72	0 DOE+00	-38.01%
					+ 20%	89.78	0.00E+00	-38.01%
H					9	92.85	0.00E+00	-38 01%
4	•					95.90	0.00E+00	-38.01%
	•				-20%	76.85	0.00E+00	-38.01%
6	• • • • • • • • •	4	4		40%			
14.3 Mg/mm	\$ \$ \$ \$ \$ \$ \$ \$	4000		Aller despite despite de la company de la co	×09-			
0 20 40	60 Time imin		100		120			

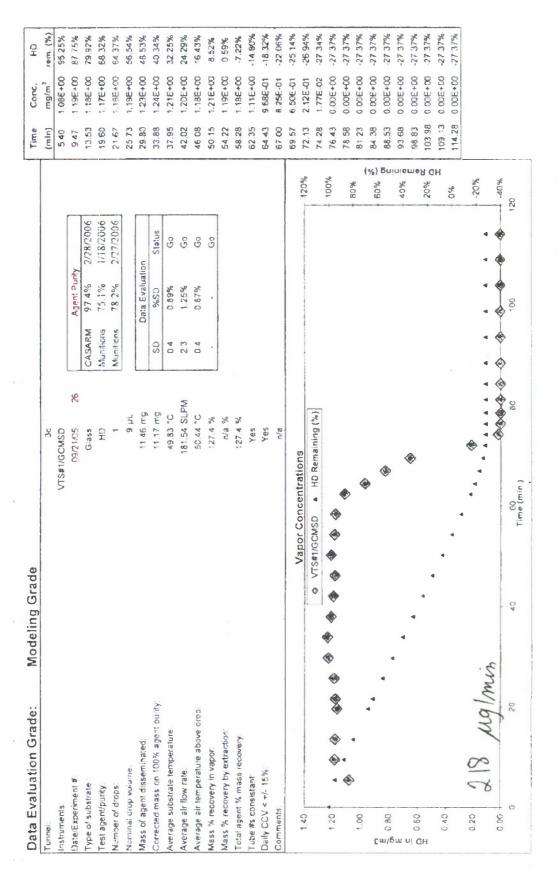
G'AgentFateTech\Wind Tunnel\Archieved Excel Sheets (NOT POLISHED)\HD GL(+---)\20050907\_3a\_61



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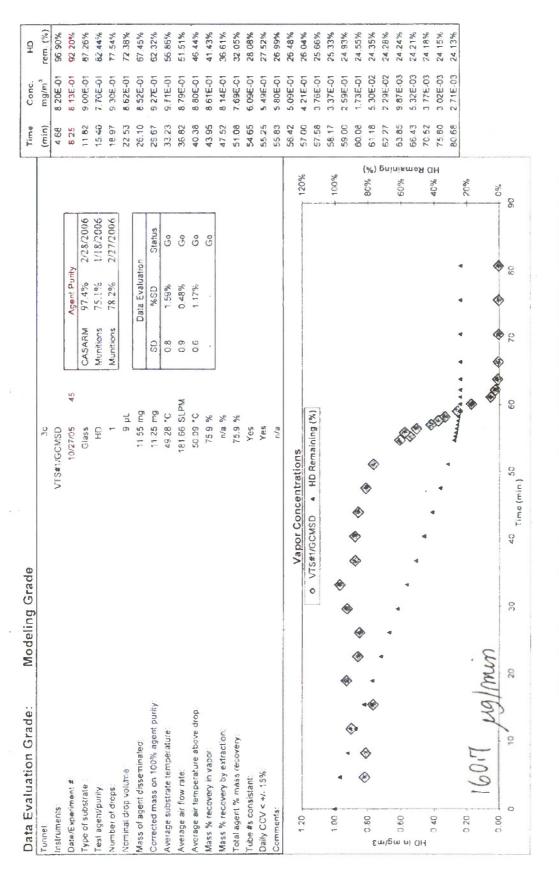




G. AgentFateTechWind TunnelArchieved Excel Sheets (NOT POLISHED) N4D GL(++0-)/20050921\_35\_26

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20051027\_3a\_79



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					Statement of Street, or other Persons and other Persons and other Persons are not only or other Persons and other Persons are not only or other Persons are			
	30					(min)	mg/m³	rem. (%)
Instruments:	VTS#1/GCMSD					4.85	7.62E-01	96.97%
Date:Experiment #:	11/21/05 51		Agent Purity	r).		7.58	7.97E-01	93 47%
Type of substrate	Glass	CASARM	97.4%	2/28/2006		10.32	8.20E-01	89.85%
Test agent/punity.	ð	Munitions	75 1%	1/18/2006		13.05	8.436-01	86.12%
Number of drops:	-	Munitions	78 2%	2/27/2006		15.78	8.13E-01	82.41%
Nominal drop volume.	1 6					18.52	8.56E-01	78.66%
Mass of agent disseminated.	11.37 mg		Data Evaluation	lion		21.27	8.78E-01	74.75%
Corrected mass on 100% agent purity:	11.08 mg	SD	%SD	Status		24.00	8.75E-01	70.83%
Average substrate temperature:	49.68 °C	90	1.25%	Ĉ		26.74	8.83E-01	%68.99
Average air flow rate:	181,64 SLPM	<b>10</b>	0.98%	Go		29.47	8.83E-01	62.93%
Average air temperature above drop:	50.20 °C	6.3	0.58%	G3		32.20	8.87E-01	58.96%
Mass % recovery in vapor.	81.3%	,	d	ဇ		34.95	8.63E-01	55.01%
Mass % recovery by extraction:	% e/u					37.69	8 69E-01	51,13%
Total agent % mass recovery	813%					40.45	8.77E-01	47.22%
Tube #s consistant	Yes					43.15	8.73E-01	43.30%
Daily CCV < +/- 15%;	Yes					45.90	9.91E-01	39.09%
Comments:	n/a					48.64	9.556-01	34.73%
	9					51.37	9.17E-01	30.54%
Vapol concer	HIOUS A Model of the control of the	Resident de constant de la constant	######################################	A. debest approver a constant and a	120%	54.10	8.12E-01	26.66%
MARKO DO NEW CONTROL OF THE CONTROL	HD Kemaining (%)					56.84	6.46E-01	23.40%
C0.1					100%	58.50	5.00E-01	21.83%
**	•					60.57	4.05E-01	20.30%
	4					62.63	1,596-01	19.34%
1080	<b>&gt;</b>				%) * 08	64.70	8,94E-02	18.95%
ا ا	4				6ui	66.33	2.53E-02	18.83%
090 11	>				60% in	67.88	9.15E-03	18.78%
4	*				nos	69.47	6,65E-03	18.76%
	•				40°k	71.30	5.70E-03	18 75%
	>					73.88	4.48E-03	18.72%
	•							
0200	•	* * * * * *	•		+ 20%			
mulby oraci	*	B CARA A	*		36			
0 10 20 30 46	50 60	202	•	38	05			
Ime (min.)								

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HEATED XFER LINE/HAPSITE  1130005 10 Glass HD HD Mundloors 9 pL 11.71 mg 11.41 mg 5.0 15.11 °C 46.9 % 16.9		arm:	Conc.	
HEATED XFER LINE/HAPSITE  11/3005 10 Glass HD HD Mundtons 9 µL 11.71 mg 11.41 mg 5D 15.11 °C 0.1 46.9 % 16.		(min)	1 mg/m <sup>3</sup>	rem. (%)
11/30/05   10   CASARM   HD   Mundions   10   Mundions   9   11/71 mg   11/		-1 45	1	
Glass CASARM HD Mundions 9 pt. 11.71 mg 11.41 mg SD 11		79.98	3 2.25E-02	92.95%
HD Mundlons 9 pL 11.71 mg 11.41 mg 5 D1 11.41 mg 6 D1 11.41 mg 7 D1 11.4		161.45	5 3.00E-02	85.36%
9 pL 11.71 mg 11.41 mg 11.41 mg 11.41 mg 11.41 mg 15.11 °C 46.9 %  14.66 °C 46.9 %  14.66 °C 46.9 %  14.86 °C 46.9 %  14.86 °C 46.9 %  14.80 m/a  15.80 m/a  16.80 m/		243.37	7 2.14E-02	77.88%
9 pL 11.71 mg 11.41 mg 11.41 mg 15.11 °C 46.9 %  14.66 °C 46.9 %  14.66 °C 46.9 %  14.86 °C		324.37	7 1,73E-02	72.31%
11.71 mg 11.71 mg 11.41 mg 11.41 mg 15.11 °C 405.37 SLPM 14.66 °C 46.9 %		409.88	8 1.31E-02	67.69%
11.41 mg SD 15.11 °C 405.37 SLPM 14.66 °C 46.9 % 46.9 % 765 No	Data Evaluation	491,35	5 2.12E-02	62.71%
15.11 °C 01 405.37 SLPM 05 46.9 % 46.9 % Yes No		572.78	8 2.05E-02	56.58%
405.37 SLPM 14.66 °C 46.9 % 46.9 % Yes No	%260	654.22	2 1.99E-03	
14.66 °C 46.9 % 16.9 %		735,65	S 0.00E+00	
46.9 %  And		817.08	8 0.00 -00	53.13%
ery  Yes No  Vapor Concentrations  No  HEATED XFER LINE  HIS Remaining 150.   A  A  A  A  A  A  A  A  A  A  A  A		902.70	0 0.00E+00	53.13%
Yes No No HEATED XFR LINE  Wapor Concentrations  Who HEATED XFR LINE  WH				
Vapor Concentrations  Napor Concentrations  HEATED XFER LINE  HATED XFER L				
Vapor Concentrations  Vapor Concentrations  HEATED XFER LINE  HARMINION (24)  WHATED XFER LINE  WHATED				
0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005				
0.035  0.035  0.035  0.035  0.026  0.035  0.015  0.005  0.005  0.005				
0.030  0.025  0.020  0.020  0.015  0.005  0.005		120%		
0.026  0.026  0.026  0.016  0.016  0.005  0.005				
0.020		+ 1009%		
0000				
0000		(		
0005 0000 0000 9,9 Mg/min		%) B		
0000 0000 0000 0000				
0,000 0,000 9,9 Mg/min	•	sms		
9.9 ma/min				
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## Data Sheet Droplet Evaporation in ECBC Wind Tunnel

 Tunnel:
 3d

 Date:
 December 19, 2005

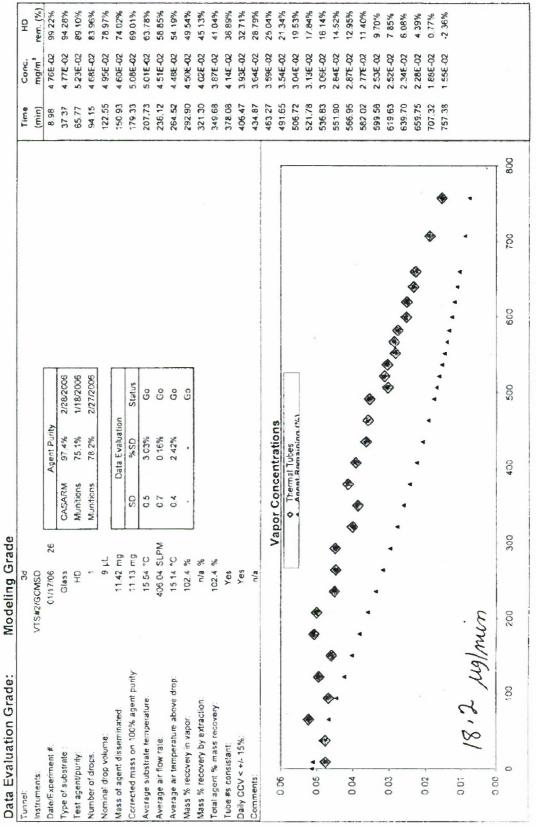
 Experiment Number:
 16

 File Name:
 20051219\_3d\_16.xls

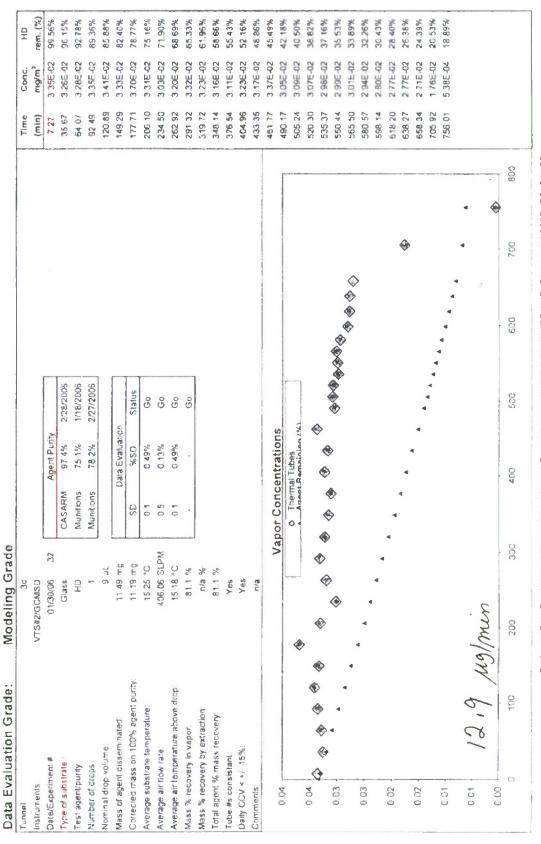
Subst	rate		
type of substrate :	Glass		
substrate sample size (mm):	36.6	0.0010	5 m <sup>4</sup>
Age			
test agent:	HD		
agent neat / thickened:	neat		
agent purity:	97.4%		
nonminal density:		mg/uL	
Contami		- V	
number of drops:	1		
nominal drop volume:	9	μL	
actual calculated drop volume:	9,212		
weight of clean substrate:	1690.268		
weight of contaminated substrate:	1701.967		
mass of agent disseminated:	11.699	_	
	11.395	_	
corrected mass on 100% agent purity:	11.12		
actual contamination density:	10.83	-	
actual contamination density based on 100% agent purity:  Control Pa		B/III	
	68.1	90	1.1
Miller Nelson temperature:			
air flow temperature:	15.4	_	3.1
Aalborg Flowmeter air flow rate:	405.85		5.2
transition section wall temperature:	13.0	_	0.0
fetch section wall temperature:	11.0	_	0.0
substrate temperature:	15.2	_	0.1
piston zone temperature:	9999.0	°C	0.0
post-test section wall temperature:	16.2	°C	0.4
mixing box wall temperature:	35.0	°C	0.0
sampling duct wall temperature:	35.2	°C	1.05
test section air flow speed:	3.21	m/s	0.0
air flow relative humidity;	0.00	%	0.1
Sampling Pa	arameters		
sampling technique:	HEATED XFER LINE		
introduction technique;			
analysis technique:	HAPSITE		
Experimen	it Timing		
start time contamination (time drop hits substrate):	12/19/05 15:37:25		
end time contamination:		De	ita
start time data acquisition (desired wind velocity achieved):	12/19/05 15:40:15	2.8	3 min.
end time data acquisition- end of vapor experiment;	12/20/05 10:04:15	1104.0	0 min.
Additional I	nformation		
weight of substrate after evaporation:	1690.3980	mg	11:30 AM, 12/21/0
residual mass of agent after evaporation:	0.1300	mg	
Extractio	n liquid		- ' IN I.
extraction liquid:	n/a 762	4 SLUPE	E: 12,4
volume extraction liquid:	n/a	mL	, '-
extraction time (ultrasonicate):	n/a	min	Mg/min
concentration of agent in extraction liquid:	n/a	μg/mL	VIII
recovered mass:	n/a	mg	
Rema	irks		-
drop delivered by:	Ken Sumpter		
	high flow, low temp, 9		
description:	mic on glass		
video monitoring: 20051219	3d 16.xls YES		

Second Color   Seco	Tunnel:			(-)	3d	Date:	12/21/05		Time	Conc.	무
Control   Cass Borcloat   Cass Borcloat   Cass Borcloat   Cass Borcloat   Cass Borcloat   Cass Borcloat   Cass Cass Cass Cass Cass Cass Cass Ca	Parameters			HEATED XFER LIN		Exp.#	17		(min)	mg/m³	rem. (%)
HD	type of substrate	construence and the second sec		Glas	ss Borofloat				3.83	2.03E-02	99.86%
100   100	test agent.			I.	Ō				47.83	2 97E-02	95.89%
9° 4% DalwChem KS 7726,2005 1986,22  0° 4% Interval to the contraction of the contractions of the contract	agent grace			190	16.				91.83	1.46E-02	\$5.39%
1135 mg 1127 mg 1136 m	agent pushy:			97.4		KS	7/26/2005		136.83	2.05E-02	89.55%
Substrate forms  Substr	humber of drops:		•		-				180.83	1.95E-02	86.38%
1155 mg 1152 mg 1152 mg 1152 mg 1152 mg 1156 mg 1156 mg 1158 m	nominal drop volume:				9 pt				224 83	1.785-02	83.42%
Substrate to the term of the t	mass of agent disseminated.			Ass Ass 46 S	58 mg				269.83	1,18E-02	61.03%
Substrate tamp! (5°) 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00 10° 60° 00° 00° 00° 00° 00° 00° 00° 00° 0	corrected mass on 100% agent purity.			1.1.2	27 mg	SD	P/H		313.83	1.99E-02	78.52%
SUBSTACTE FORM 406	Miller Neison temperature			68.1	16 °C	0.1	Pass		362.83	2.29E-02	74.75%
SUBSTRACT FORM FOR TEST OF THOSE OF Pass SUBSTREAM STATE OF THE SUBS	transition section wall temperature:			12.5	0.96	0.2	Pass		407.83	2.556-02	70.83%
SUBSTACE TOMP   16.22 °C   0.4   Pass   540.83   1.71E-02     SERVING   SERVING   10.3   Fail   554.83   0.00E+00     SUBSTACE   TOMP   40.6   VES   Fail   554.83   0.00E+00     SUBSTACE   TOMP   550.0 °C   10.3   Fail   554.83   0.00E+00     SUBSTACE   SUBSTACE   TOMP   550.0 °C   50.0 °C   50.0 °C     SUBSTACE   S	fetch section wall temperature:	- (	7		D. 96	0.2	Pass		45:83	2.17E-02	67.09%
SLAM 406  Vapor Concentrations	post-test section wall temperature:	ンプレタケロ	cle tomb. S		22 °C	0.4	Passs		495.83	1,716-02	64.01%
\$\$\frac{103}{\text{Fall}}\$ \text{Fall}\$ \text{64.83 0.006+00}\$ \text{628.83 0.006+00}\$ 628.83 0.	mixing box wall temperature.				0.00	0.0	Pass		540.83	0.00E+00	62.63%
SLAM 406 YES Faul  Vapor Concentrations	sampling duct wall temperature:			35,1	15 °C	1.03	Fail		584.83	0.00E+00	62 63%
SLAM 406 Fail  Vapor Concentrations  HEATED XFER LINE  HEATED XFER LINE  HORmaining (%)  HORMaining (%)  WAS MAN  ON  100%  10	description:								628.83	0.00E+00	62.63%
003	Tube #s consistant: Daily CCV < +/- 15%	SLAMI	904	iii ii′	Sile						
003			Vapor Co	ncentrations				70126			
1003.			1	TED XFER LINE				R 27			
0.02	,		1	(v) fammena	- General retreated			2000			
002	4_							100%			
0.02	0 03	4	•	•							
0.02	61		•	•	•						
0.002	<b>€</b> 2005	<ul><li>♠</li><li>♠</li></ul>	•	•	•	•	,				
2001 7, 9 Mg/min 300 300 600 700 600 700	ni ni c		•		•	•	•				
7,9 Mg/min 200 300 400 500 600 700	Ф 2200 ан		•								
7,9 Mg/min	0.01		•								
7,9 Mg/min								è			
0 100 200 300 459 500 600 70		Imin				•	•	8			
	0	200	3000		200	and the second s	9009	700			

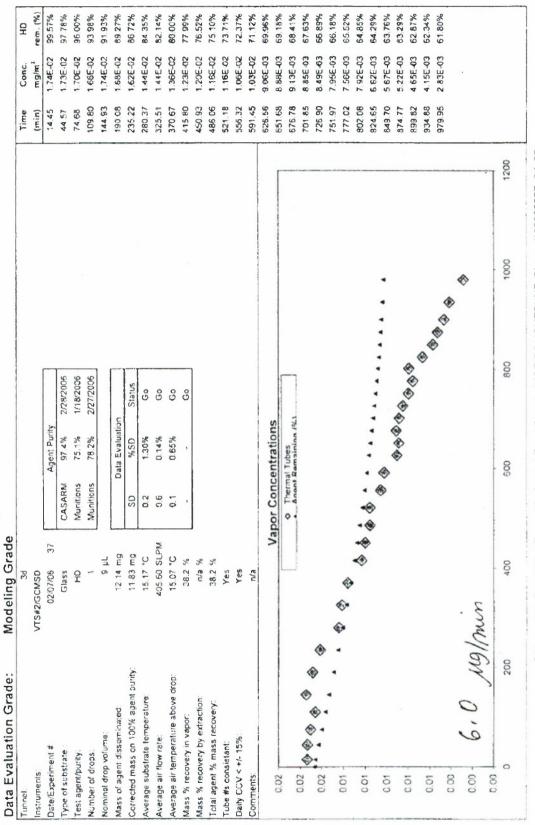
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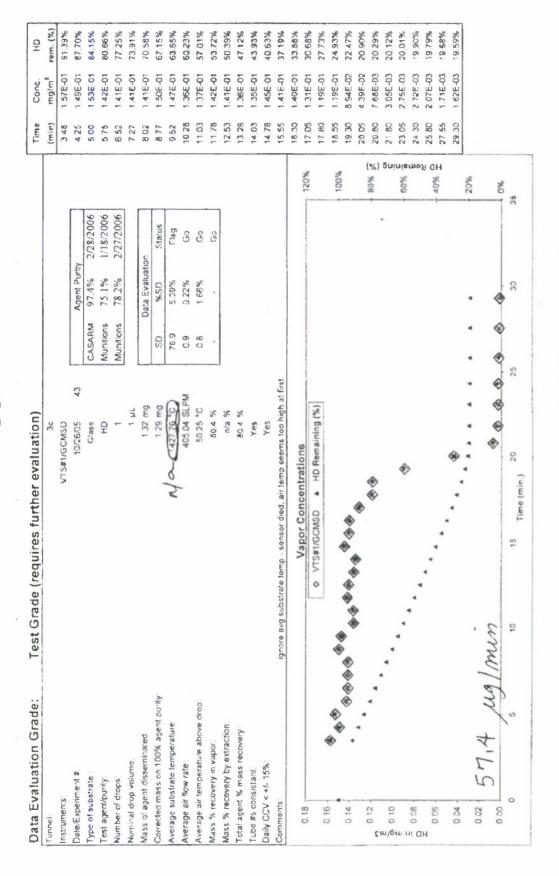
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Data Evaluation Grade: Test Grade (requires further evaluation)		Time	Conc.	모
Tunnel 3c		(min)	mg/m3	rem. (%)
Instruments.		4 95	0.00E+00	100 00%
DateExperiment # Agent Purity	,,,,,,,,,,,,	7.10	2.15E-01	95.19%
Type of substrate. CASARM 97.4% 2.	2/28/2006	9.25	1.98E-01	77.19%
Testagent/purity: Nuntions 75.1% IV	1/18/2006	11,40	2.03E-01	62.62%
Number of drops: 1 Numitiens 78.2% 2	2/27/2006	13,55	1,89€-01	48.37%
Nominal drop volume.		15.70	2.02E-01	34.15%
Mass of agent disseminated. Data Evaluation		17.85	1.996-01	19.58%
Corrected mass on 100% agent purity SD %SD	Status	20.00	1.99E-01	5.10%
Average substrate temperature: 50.32 °C 0.8 1.64%	Go	22.15	1,92E-01	-9.13%
Average air flow rate: 338.06 SLPM 1.5 0.38%	co	24.30	1.39E-01	-21.20%
Average air temperature above drop. 0.7 1.45%	Co	26.45	9.92E-02	-29.88%
Mass % recovery in vapor:	Fileg	28.60	4.93E-02	-35.28%
Mass % recovery by extraction:		31,25	0.00E+00	-37.49%
Total agent % mass recovery:		35.40	0.00E+00	-37.49%
Tube #s consistant: Yes		40,55	0.00E+00	-37.49%
Daily CCV < +/, 15%: Yes		45.70	0.00E+00	-37 49%
Comments:		50.85	8.20E-02	44.84%
		56.00	0.00E+00	-51.78%
Adpor conce	120%	58.67	0.00E+00	-51.78%
♦ VTS#1 ► HD Remaining (%)	300	58.85	0.00E+00	-51.78%
♦	F 35	59.04	0.00E+00	-51.78%
020	80%	59 22	0.005+00	-51.78%
>		59.40	0.00E+00	-51.78%
	%) %09 +	59.59	0.00E+00	-51.78%
and the state of t	40% H	52.23	0.00E+00	-51 78%
4		26 65	0.00€+00	-51.78%
•	20% F	60,15	0.00E+00	-51,78%
•	S GI	60.34	0.00E+00	-51,78%
•		60.52	0.00E+00	-51.78%
000	+ .20%	60.70	0.00E+00	-51 78%
78-7 40/min	-40%	NAME NAME NO AND A STORY OF THE PARTY OF THE		
	%09	PRICE		
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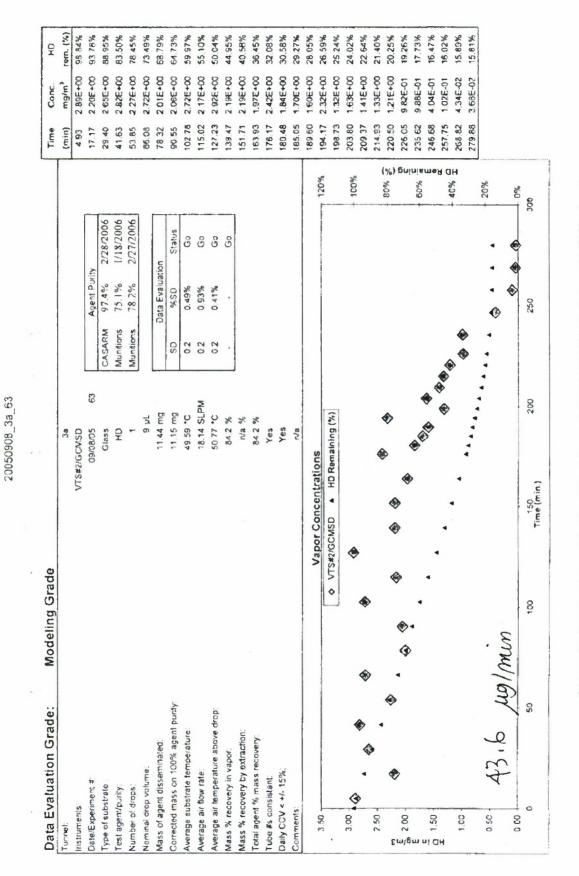
G. Agent Fate Tech Wind Tunner Archieved Excel Sheets (NOT POLISHED): HD GL(+-+-)/20050919\_3c\_22

Data Evaluation Grade: Modeling Grade			Time	Conc.	유
Tunnel.			(min)	mg/m³	гет. (%)
Instruments			410	1.62E-01	89.22%
Date/Experiment #	Agent Purity		5.00	159E-01	84 54%
Glass	97,4% 2/28/2006		5.90	1.52E-01	80.01%
Test agen/fourty: HD Munitions	75.1% 1/18/2006	de Librium in maria	289	1.38E-01	75.04%
Number of drops:	78.2% 2/27/2006		8 03	4.19E-01	65.46%
Vominal drop volume.			9.10	1.25€-01	56.07%
Mass of agent disseminated: Da	Data Evaluation	_	10.02	1.43E-01	52.08%
Corrected mass on 100% agent purity.	%SD Status		10.92	1.50E-01	47.81%
Average substrate temperature. 0.4	0.74% Go		11.82	1.316-01	43.72%
Average air flow rate: 1.7	0.43% Go		12.72	1.27E-01	39.96%
Average air temperature above drop: 60.12 °C 0.9	1.52% Go		13.62	1.42E-01	36.05%
Mass % recovery in vapor:	. Go		14.52	1,33E-01	32.05%
Mass % recovery by extraction:			15,42	1,335-01	28.18%
Total agent % mass recovery:			16.32	1.38E-01	24.24%
Tube #s consistant: Yes			17,22	1.32E-01	20.31%
Daily CCV < +/- 15%.			18.13	1.19E-01	16.58%
Comments: n/a			19,03	1,336-01	12.90%
			19.68	1,16E-01	10.28%
Agino conse		120%	20.27	9 89E-02	8 25%
◆ VTS#1/GCMSD ★ HD Remaining (%)			20.85	6.21E-02	8.73%
		100%	21.43	2.16E-02	5.53%
0.35		!	22.14	4.41E-03	5.64%
•			22.98	4.01E-03	5.52%
0.30		%)	24.18	2.41E-03	5.40%
9 0.25		Buţ	25.77	2.11E-03	5.28%
		+ 60% in	29,10	8.15E-04	5.12%
0.20		mes	34.20	7.336-04	5.00%
****		40%	37.03	7.81E-03	4 60%
			37.62	7.24E-03	4.46%
0:0			38.20	7.965-03	4.32%
		+ 20%			
JTIB Mg/min	شفت	0%			
5 10	40	49			
fund)	MINISTER CONTRACTOR CO				

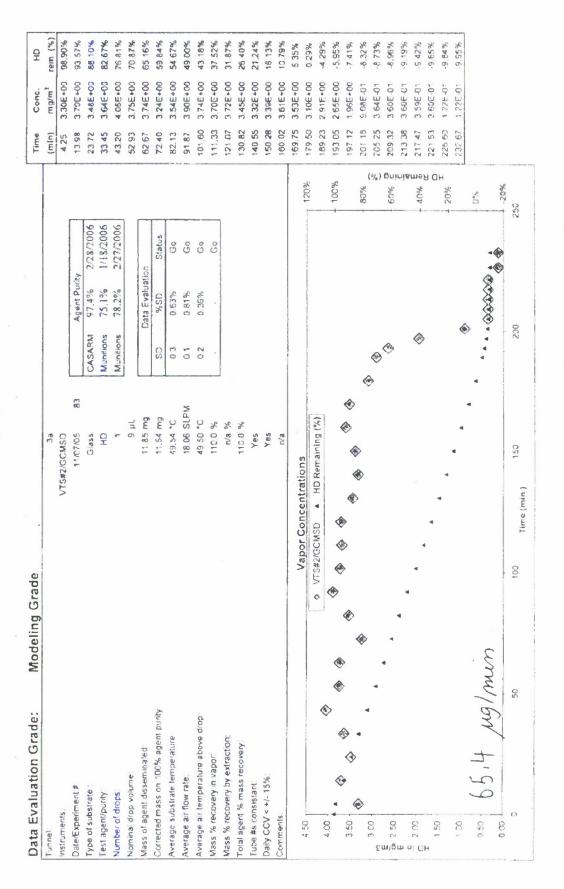
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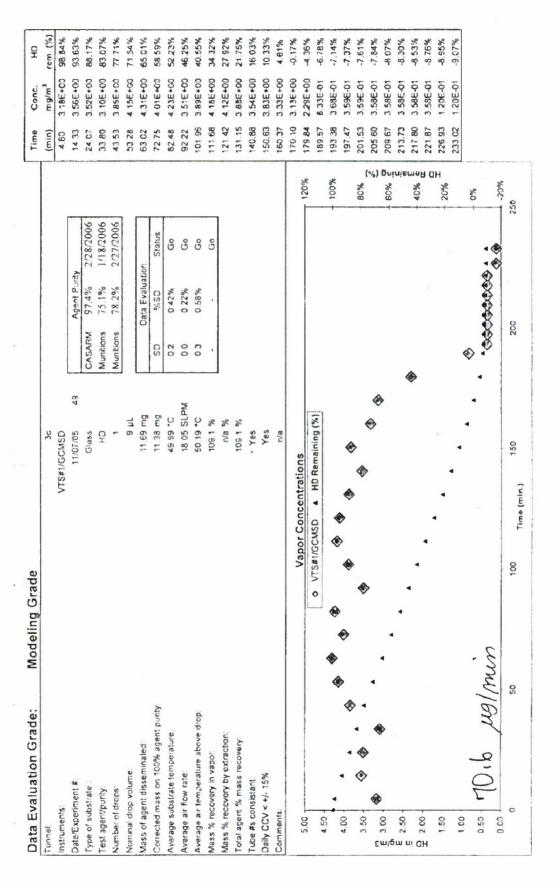
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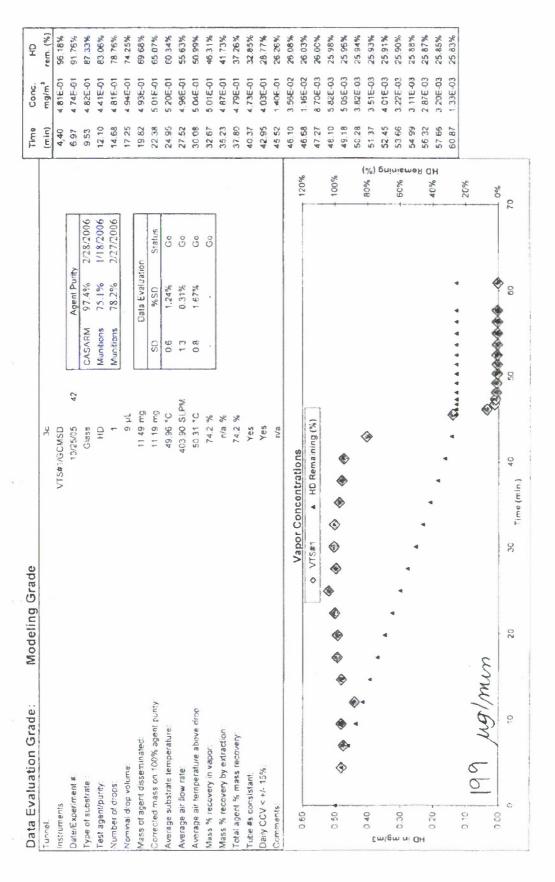
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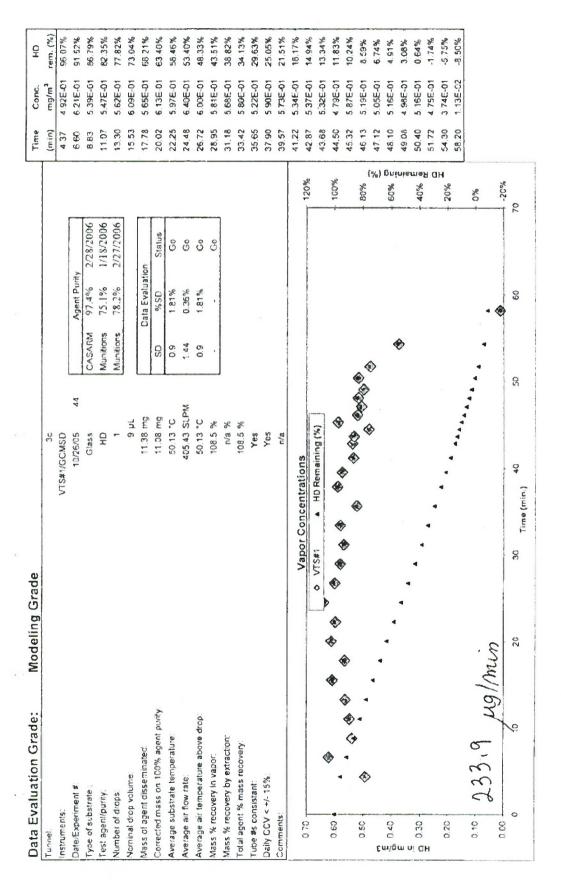
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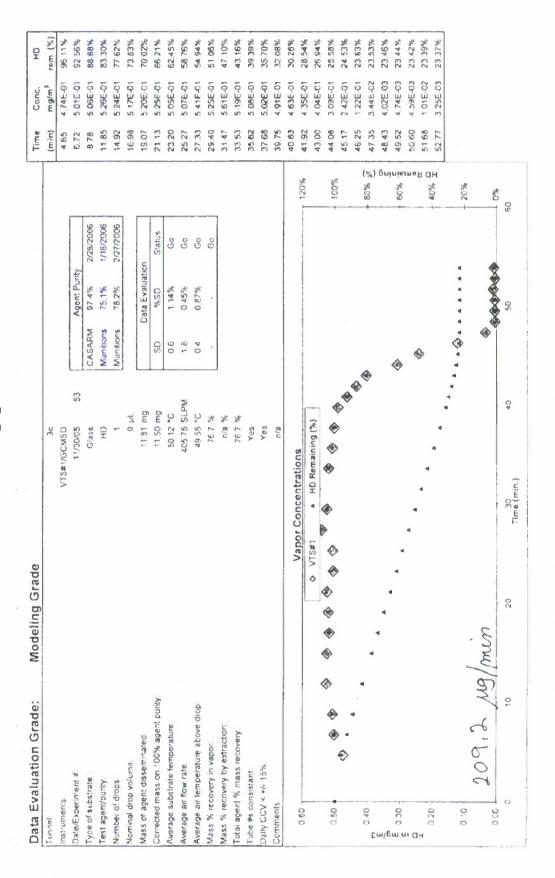
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